AN ANALYSIS OF VISCERAL INJURIES IN BLUNT ABDOMINAL INJURY

Dissertation

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BRANCH I

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CERTIFICATE

This is to certify that the dissertation entitled "AN ANALYSIS OF VISCERAL INJURIES IN BLUNT ABDOMINAL INJURY" is a Bonafide work done by **Dr.T.PERUNGO**, in M.S BRANCH I GENERAL SURGERY at Government Chengalpattu Medical College & Hospital, Chengalpattu, to be submitted to The Tamilnadu Dr. M.G.R Medical University, in partial fulfillment of the University Rules and Regulation for the award of M.S Degree Branch I General Surgery, under my supervision and guidance, during the academic period from June 2005 to March 2008.

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DECLARATION

I solemnly declare that this dissertation **"**AN ANALYSIS OF VISCERAL INJURIES IN BLUNT ABDOMINAL INJURY"**"** was prepared by me at Government Chengalpattu Medical College & Hospital, Chengalpattu**,** under the guidance and supervision of **Prof. Dr. G. RAJA BILLY GRAHAM M.S.,** Professor of Surgery, Chengalpattu Medical College & Hospital, Chengalpattu.

This dissertation is submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the university regulations for the award of the degree of M.S. Branch 1 General Surgery.

Place: Chengalpattu.

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CONTENTS

INTRODUCTION

TRAUMA is a major cause of mortality and morbidity in day to day life. Trauma can cause fatal injuries involving any major organ or system in the body like central nervous system, cardiovascular system, respiratory system, genitor-urinary system, skeletal system, abdomen etc., Most of the injuries reveal itself earlier, but for blunt abdominal injuries which can be silent initially but causing fatal outcome later.

Abdomen is the third most common organ injured following extremities and head injury. Most preventable deaths are those occurring in abdomen. Here we recollect the words of Ogden Nash “Your hopeless patients will live, your healthy patients will die” which aptly fits to blunt abdominal injuries.

Blunt abdominal injuries can occur from trivial insult to a major force acting. 80% of the injuries are due to Road Traffic Accidents. Assault, fall from height, fall of weight over the body etc., are other modalities accounting for remaining percentage.

Today we have well developed investigation modalities for diagnosing the blunt abdominal injuries. The clinician who first sees the patient is an important deciding factor apart from type of injury, time between injury and intervention, general health of the patient etc., affecting the outcome.

In this study effort has been made to know about the different kinds of intra abdominal organs injured from various etiologies and the out come overall in blunt abdominal injuries.

AIMS AND OBJECTIVES

This dissertation has been chosen to study about the blunt abdominal injuries encountered in Govt. Chengalpattu Medical College Hospital, Chengalpattu for a period of two and half years from June 2005 to August 2007.

Aims of the study are:-

1. To find the incidence of Hepatosplenic injuries among visceral injuries in blunt abdominal injury.
2. To find the incidence of various etiologies
3. To find the different modes of presentation of blunt abdominal injuries
4. To find the age and sex distribution
5. To find the incidence of various organs injured in blunt abdominal injuries
6. to compare the incidence of solid organ injury with others
7. to compare conservative and interventional approach.
8. To find the effects of time interval between injury and intervention in the outcome.
9. To analyse various investigation modalities
10. To analyse associated injuries
11. To compare the results with other existing studies

REVIEW OF LITERATURE

HISTORY

History of blunt abdominal injury dates back very long. Susrutha Samitha (600 B.C.) deals with bowel ruptured by injury. Aristotle was the first to record a case of blunt injury to the abdomen causing death in a deer. He stated " A slight blow will cause rupture of intestine without injury of the skin". Morgagni in 1761 described the clinical features and autopsy findings in a patients who died of intestinal rupture following blunt injury to abdomen.

Till 19th century conservative measures were followed in the management of blunt abdominal injuries. This was because of lack of diagnostic modalities and high mortality associated with laparotomy. Walter in 1859 was the first to perform laparotomy for blunt abdominal injury. Only after the first world war interventional approach gained popularity.

Motz, a French surgeon in 1890 proposed three possible mechanism of injury in blunt trauma – ECRASEMENT (Crushing), DECHIRURE (Shearing) and ECLATEMENT (Bursting). Neuolof & Cohen introduced the technique of Abdominal paracentesis using spinal needle for diagnosis of blunt abdominal injury. Wright improved the techniques by aspirating all four quadrants.

The development of EMS (Emergency Medical Services) was boon in the management of blunt abdominal injuries. EMS comprises trauma squads, the persons trained in stabilizing and transport of injured persons to Hospitals. EMS intervene in the golden hour (i.e.) within one hour of injury and hence they play a major role in decreasing the mortality by initial resuscitation and by reducing time lag between injury and hospitalization.

ANATOMY OF THE ABDOMEN

Abdomen can be divided into four areas;

1. Intra thoracic abdomen.
2. True abdomen
3. Pelvic abdomen
4. Retroperitoneal abdomen.

INTRA THORACIC ABDOMEN

This area lies beneath rib cage and is not palpable;

Contents: Diaphragm.

Liver

Spleen

Stomach.

TRUE ABDOMEN

This portion lies between thoracic and pelvic abdomen and contains

Small bowel

Large bowel

Mesentery

Greater Omentum.

PELVIC ABDOMEN

This portion lies in the hollow of pelvis.

Contents: Rectum

Bladder

Urethra

Small bowel

Prostrate

Uterus.

Ovaries

Fallopian Tube.

RETROPERITONEAL ABDOMEN

This portion lies behind the peritoneum and contains

Kidneys.

Ureters.

Pancreas

2^{nd} and 3^{rd} parts of duodenum.

Ascending and descending colon,

Great Vessels, Lymphatics and Lymph nodes

MECHANISM OF INJURY

BIO-MECHANICS OF INJURY:

Both extrinsic and intrinsic factors play a role in the mechanism of injury.

EXTRINSIC:-

These are the factors acting from outside the body and includes;

1. Impact force
2. Strain
3. Cavitation

Kinetic energy is the most important factor causing all the effects in blunt abdominal trauma.

Kinetic energy is one half of the mass of the object times its velocity squared.

K E = m/2 x v^2

a. Impact force :-

The kinetic energy is impacted to the patient (IMPACT FORCE) and injuries occur.

b. Strain :-

The resultant physical deformity of victim's body produced by impact force is called Strain. It is of two types;

(i) Tensile strain

(ii) Sheer strain

(i) Tensile Strain:-

It is the force acting along the long axis of a particular structure causing stretching or compression.

(ii) Sheer Strain:

It is the force acting perpendicular to the long axis of a particular structure causing sheering or tearing.

c. Cavitation:-

When an outside force is impacted on a tissue it tends to move the tissue away from the point of contact. It is of two types;

(i) Temporary

(ii) Permanent

(i) Temporary Cavitation:-

The surface and structural tissue of the body are stretched but the overall shape of the body is maintain. Most often this type is seen in blunt injury of abdomen.

(ii) Permanent Cavitation:-

Cavity created along the line of impact force that causes tearing or compression of tissue leaving behind a permanent deformity of affected tissue.

INTRINSIC FACTORS:-

This implies to the factors in victim and includes;

1. Elasticity
2. Viscosity
3. Cohesiveness

a. Elasticity:-

It is the tendency of the tissue to regain its original shape

E.g.:- Skin, Subcutaneous tissue – elastic

Liver, Spleen, Kidney – Inelastic

b. Viscosity:-

It is the tendency to resist changes in shape while in motion, when the force exceeds elasticity.

c. Cohesiveness

When the impact force acting deforms a specific body beyond the limit of either its elasticity or viscosity, the cohesiveness is lost and disruption of structure occurs.

PATHOPHYSIOLOGY IN BLUNT ABDOMINAL INJURIES:-

Blunt abdomen injury is caused by two mechanisms;

1. Compression force
2. Deceleration force

Compression force acts during direct blow or extrinsic compression against fixed object (E.g.: Seat belt injury). This mostly causes tears or sub capsular hematomas of solid organs. It also cause transient increase in intra luminal pressure in bowel leading to its rupture.

Deceleration forces cause stretching and linear shearing which tends to rupture the supported (fixed) structures at the junction between free and fixed part.

EVALUATION OF PATIENT WITH BLUNT ABDOMINAL TRAUMA

The abdomen is a diagnostic black box. Fortunately with few exceptions it is not necessary to determine which intra-abdominal organs are injured, only whether exploratory laparotomy is necessary[2].

INITIAL EVALUATION AND RESUSCITATION

PRIMARY SURVEY

- Establish patent and controlled airway
- Ensure adequate gas exchange
- Estimate and correct the circulatory status.

SECONDARY SURVEY

- Ask brief history
- Comprehensive assessment of suspected and unsuspected injuries
- Complete physical examination
- Appropriate investigations to know the extent of injury
- Insertion of Nasogastric tube and urinary catheter.

TERTIARY SURVEY [REEVALUATION & DISPOSITION]

Comprehensive and systematic re-evaluation after limb and life threatening injuries has been cared. Patients are systematically reexamined for occult injuries not evident on presentation owing to the emergency of other life threatening priorities.

History of mode of trauma as well as physical examination remains the important factor in the surgical decision making process.

HISTORY

- Time and type of injury noticed – Specific details of injury mechanism are critical. In automobile accidents one should inquire into the
    a. size of the vehicle
    b. The location of patients within the vehicle
    c. What was the type of accident? Frontal Impact, side impact, sideswipe, rear impact and rollover have their own unique pattern of injury.
    d. Was the victim wearing a restraint device and if so, what type?
- In case of injury due to fall, the height from which patient had fallen and the position in which he was found.
- The patients level of consciousness at the scene of accident and whether or not patient has been taking drugs or alcohol to be inquired into.
- In case of stab injury type of weapon should be inquired into.
- All details regarding pain, vomiting, urinary retention, constipation etc. are obtained.
- History of drugs, alcohol, past medications, past medical history and chronic medical condition, any drug allergy etc are noted

PHYSICAL EXAMINATION

GENERAL EXAMINATION

Vital signs, pallor, cyanosis, level of consciousness and alertness, bleeding points, fractures are recorded.

In vital data – pulse, blood pressure and respiration are recorded

- If the patient is in shock with severe pallor, massive intraperitoneal bleeding should be suspected.
- Halted and labored breathing - suspect diaphragmatic irritation due to upper abdominal injury

EXAMINATION OF ABDOMEN

INSPECTION

Skin

Bruise from tyres, seat belt (or) blunt objects are noted. Ecchymosis and abrasions and in case of penetrating injury site are noted.

London Sign: Imprint of clothing (or) seat belt noted on the skin helps to identify the site of injury.

Shape of abdomen: Distension whether localized (or) generalized **Movement with respiration:** Decreased/absent/normal.

Others : Hernial orifices for any traumatic hernia, pelvic deformity, Perineal hematoma, Blood staining in urethral meatus should be looked for.

If subcutaneous emphysema is present suspect intrathoracic injury. It may also occur in injury to retroperitoneal duodenum, distal colon and rectal injuries.

PALPATION

- Tenderness- helps in localizing the site of injury.
- Guarding occurs in peritonitis (or) spasm of muscles in response to local injuries.
- Rebound tenderness indicates significant intra abdominal injury.
- Abdominal rigidity warrants laparotomy in most cases.

PERCUSSION

Percuss the liver, spleen and check for distended loops of bowel, free fluid and non shifting dullness (Ballance's sign) shifting dullness indicates fluid or blood. Suprapubic dullness indicating full bladder is important for urethral injuries.

AUSCULTATION

The presence of bowel sounds does not rule out peritonitis but their absence suggest the presence of peritonitis or intraperitoneal hematoma.

RECTAL EXAMINATION

It is important to see for any bleeding per rectum in rectal injuries, bony spicules projecting out in pelvic injuries, tone of anal sphincter and sensations noted. Floating prostrate (Vermooten's sign) is seen in rupture of the membranous urethra. Sphincter tone is decreased if spinal cord injury is present.

GENITALIA EXAMINATION

For laceration of vagina and blood at external uretheral meatus (Perineal or vaginal laceration). The classical signs of peritonitis like diffuse tenderness

guarding and rebound tenderness make exploratory laparotomy obligatory. Some patients may not have all these findings due to associated intracranial injuries, spinal cord injuries or intoxication due to alcohol or drug intake.

Guarding and tenderness may be totally missing in a profoundly shocked patients.

Repeated close watch for a change or appearance of a new sign in abdominal examination is extremely important if it is done by experienced surgeon. The per abdomen examination is also not very accurate and the fallacies are:

1 It is difficult to interpret in unconscious patient or restless patient.
2 Reflex guarding in extra abdominal trauma like ribs or spine may confuse the clinician.
3 Development of physical signs takes reasonably long time and so it delays the exploration if necessary.
4 In the presence of neurological deficit, it is difficult to interpret sign.

OTHER SYSTEMS

(A) RESPIRATORY SYSTEM:

For fracture ribs, haemo or pneumothorax, Flail or Stove in chest, lung contusions, laceration, collapse, aspiration etc. Abdominal and thoracic trauma should be concentrated together in the initial evaluation because the dome of diaphragm can rise to the fourth intercostal space during full expiration.

(b) CVS

For hemodynamic stability, cardiac tamponade, etc.

(c) CNS

Glasgow coma scale (GCS) for level of consciousness, higher mental functions, alertness, etc noted.

(d) Extremities

Fractures are noted.

INVESTIGATIONS

A) Laboratory Investigations: Hematologic and blood chemistry values are of limited use immediately following abdominal trauma but base line tests are important because subsequent changes may be the first sign of occult injury.

- **Hb% level:** In severe hemorrhage Hb% drastically comes down and emergency blood transfusion may be required.
- **Hematocrit:** Falling levels indicate recent or acute blood loss.
- **Blood Coagulation studies** are important in patients who requires massive transfusions or who have concomitant hepatic disease.
- **Urine Microscopy:** Hematuria indicates genitourinary trauma or severe polytrauma.
- **Urine analysis:** For toxic drug metabolism is also appropriate in select patients.
- **Leukocytosis:** Following blunt trauma abdomen, leukocytosis is common and generally non specific.
- **Serum amylase** lacks sensitivity and specificity for intra abdominal injury.

- **LFT** is important in liver, biliary system and pancreatic injuries.
- **Arterial blood gas** analysis is warranted in intubated patients or those who are at risk for subsequent pulmonary de-compensation and in anticipation of acid base disturbances.
- For patients hospitalized with major trauma, baseline serum levels of electrolytes and renal and liver function are appropriate.

B) Radio-logic investigation: Radio-logic procedures in stable patients with blunt abdominal injury may be useful when physical examination and laboratory investigations are inconclusive.

i. **Plain x-ray chest and abdomen:** Upright films of chest and abdomen should be taken after keeping patient 5-10 min in upright positions in addition to supine films of the abdomen except in spinal injuries and hypotensive patients. Occasionally additional information may be obtained from lateral and left lateral decubitus films. At least 800 ml of intraperitoneal blood is required to be evident on plain abdomen radiograph. The following findings may be observed.

- Fracture right ribs especially below fourth –10% chance of liver injury.
- Fracture left ribs below fifth – 20% chance of splenic injury.
- Fracture pelvis
- Air under diaphragm
- Dome Sign
- Falciform ligament sign
- Double wall sign

- Classical stippling of air indicates rupture of retroperitoneal portion of duodenum or rectum.
- Obliteration of the psoas shadow – retroperitoneal or intraperitoneal fluid or blood.
- Flank strip sign-separation of gas filled left and right colon from peritoneal fat line indicates intraperitoneal fluid or blood.
- Hepatic angle sign-Loss of the distinct inferior and right lateral border of liver as blood accumulates between the hepatic angle and the peritoneum.
- Dog ear sign-Accumulation of blood that gravitates between pelvic viscera and side walls on each side of the bladder.
- Signs of the splenic injury
  - Obliteration of normal splenic outline.
  - Indentation of greater curvature of stomach
  - Medial displacement of gastric air bubble
  - Obliteration of left psoas shadow
  - Elevation of left hemi diaphragm
  - Associated fracture of one or more left lower ribs.

ii. **Contrast Studies:** Indicated in cases of injury to stomach, duodenum and small bowel. Use of barium is dangerous because it causes severe peritoneal reaction if it leaks in to peritoneal cavity. In intramural hematomas of duodenum coil spring or stack of coins appearance is present. (Fullen WD et al 1974).

iii. **Intravenous urography:** Should be performed regardless of hematuria as major renal injuries and pedicle injuries can occur without hematuria.

The conventional procedures mentioned so far are inadequate, inconclusive and misleading in the diagnosis of a complex and perplexing problem of blunt abdominal trauma and therefore, direct, more accurate examinations are resorted to recently laparocentesis is one such procedure.

C) LAPAROCENTESIS

The methods of laparocentesis are

a)	By needle	1. A single tap	2. 4 Quadrant tap
b)	By a cannula	1.Peritoneal tap	2. Peritoneal lavage.

Through laparocentesis by a needle has advantages of being a quick, easy, bedside procedure requiring no elaborate facility or experience, its accuracy rate is only 65-75%. It is traumatic in itself (particularly 4 quadrant tap) and negative results do not rule out visceral injuries. Yet this procedure is better than usual conventional procedures.

The peritoneal tap (by cannula) and lavage are still better methods – particularly the later one.

a. Abdominal paracentesis by needle:

It is useful diagnostic aid only for those in which physical examination is equivocal, in head injury, spinal etc.

Technique: Abdomen is cleansed with spirit. A 18 gauge short level spinal needle is attached to a syringe and inserted through abdominal wall after prior infiltration of local anesthesia. Suction is applied to the syringe as the needle slowly advanced in to the abdomen at various sites; A return of 10 ml of non clotting blood constitutes a positive tap. Tap blood obtained from punctured vessels always clots.

Considerations:

1 Areas of abdomen scars or other points of possible bowel fixation to wall should be avoided.

2 Direction of needle inside abdominal cavity should be changed only withdrawing the needle just superficial to peritoneum and then reintroducing it.

3 It should be avoided in presence of marked distension of bowel, because if punctured abnormally altered intraluminal pressure may cause leakage.

b) Diagnostic Peritoneal Lavage (DPL):

The introduction of diagnostic peritoneal lavage (DPL) by Root et al 1964 provided a rapid, inexpensive, accurate and relatively safe adjunctive diagnostic modality in the management of patients with blunt abdominal trauma. DPL is helpful in determining the presence of blood or enteric fluid due to intra abdominal injury.

DPL remains the most sensitive test available for determining the presence of intra abdominal injury[5].

There are three fundamental methods of introducing the DPL catheter into the peritoneal cavity. These are:

1. Open technique (Perry et al 1970)
2. Percutnaeous or closed technique (Jashidi/Lazorus Nelson)
3. Semi open technique.

1. Open Technique(Perry et al 1970, Sachatello and Bivins 1976:Thal and Shires 1973):

After decompressing stomach and bladder and infiltrating skin with local anaesthesia, a 3 cm long incision is given 3 inches below umbilicus in the midline with No.11 knife extended down till peritoneum is reached. Grasp the peritoneum, raise it with hemostat and place 2-0 chronic purse string suture around 2cm diameter circle. Peritoneal dialysis catheter (v4900) mounted on a trocar is introduced in to peritoneal cavity through the incision by a rotary motion. While catheter is being inserted the patient is asked to tense his abdominal musculature .As soon as trocar penetrates into the peritoneal cavity, it is removed and the catheter is advanced towards pelvis till all the holes are inside the abdominal cavity. Aspiration is done through catheter with 10c.c syringe. If the aspiration yields frank blood, bile stained or faeculent fluid, it is termed as positive aspiration and lavage is not carried out. On the other hand if aspiration does not yield anything, 500-1000cc of ringer lactate solution (20 ml/kg of body wt with maximum of 1000cc) is infused intraperitoneally with an intravenous infusion set. Usually the fluid can be introduced 10-15 minutes .As soon as the bottle is empty, the bottle is kept on the floor and by siphonaction the peritoneal fluid drains back in to the bottle. The whole procedure is usually complete within 25-30 minutes.

2. Percutaneous or closed (Jamshidi /Lazarous Neison) technique:

- Done with an intracath, a dialysis catheter with a trocar inserted over a wire
- Takes less time but is not reliable as the tip may be blocked by omentum.

- It is related to high rate(8%) of hallow viscous perforation and vascular injury. as this approach consists of inserting the catheter in blind percutaneous fashion.

3. Semi Open Technique:

It is rapid safe and extremely reliable (Moore JB, Moore EE, Morkovchick 1981).

Procedure: Before lavage, stomach and bladder are decompressed with a nasogastric tube and Foleys Catheter respectively .The periumbilical area is infiltrated with local anaesthesia after due preparation. A curved incision is made to one side of umbilicus at the level of infraumbilical ring. The incision is carried down to the linea alba, ensuring meticulous hemostasis. A 5 mm incision is made in linea alba and free edges are grasped with a towel clips, a standard dialysis catheter with trocar is inserted toward the pelvis. Once the peritoneum is punctured the trocar is with drawn and catheter is advanced to the pelvic floor. The tap is considered positive if greater than 10 ml of blood is aspirated otherwise 1 liter of warmed 0.9% sodium chloride (Nacl) is infused and if the clinical condition permits the patient is rolled from side to side to enhance intra peritoneal sampling The saline bottle is then lowered to the floor for the return of lavage fluid by siphonage. A minimum recovery of 75% lavage fluid id required for the test to be considered valid. The fluid is then sent for laboratory analysis of Red and White blood cells counts (RBC, WBC), lavage amylase (LAM) and lavage alkaline phosphatase (LAP) levels and examination for the presence of bile.

The standard criteria for interpreting lavage data in blunt abdominal trauma is based on the work by “S.S.Hanna, 1990 in Management of blunt trauma abdomen”.

Positive:

- Aspiration of >10ml of free flowing unclotted blood.
- Grossly bloody lavage return.
- Lavage fluid exists via Foleys Catheter or chest tube.
- Evidence of food, foreign particles or bile (enteric content) in lavage fluid
- RBC>100,000/mm.
- WBC>500/mm(confirmed by repeat DPL).
- Enzymes –Amylase >175 IU/dl),Alkaline phosphatase >3IU
- Presence of bile in lavage fluid confirmed bio-chemically.

Intermediate(Equivocal):

- Aspiration of <10 ml of free flowing unclotted blood.
- RBC 50,000-100,000/mm.
- Amylase >75 U/dl<175 U/dl

NEGATIVE:

- RBC <50,000/mm
- WBC 100-500/mm
- Amylase<75 U/dl

INDICATIONS[7]:

In patients with

- Equivocal pulmonary embolism
- Unexplained shock or hypotension
- Altered sensorium
- Cord injury

The only real absolute contraindication is represented by A clear indication of laparotomy The prior abdominal surgery, a gravid uterus and massive obesity are relative contraindication[6].

The reported sensitivity and specificity are 82.8-96.3% and 87.3-99.5% respectively[8].

D) ULTRA SOUND:

Ultra sound performed by a surgeon or an emergency physician in emergency department has largely replaced DPL[9].

The objective of ultrasound examination is to search for free fluid. It can also evaluate the liver and spleen once free fluid is identified.

ADVANTAGES:

Non invasive

No Radiation

Useful in resuscitation room or emergency department

Can be repeated

Used during initial evaluation

Low cost

DISADVANTAGES:

Examiner dependent

Obesity

Gas Interposition

Lower sensitivity for free fluid less than 500 ml.

False negatives-Retroperitoneal and hollow viscous injuries

Sensitivity ranges from 80-90% and specificity ranges from 90-95%[10].

E) COMPUTER TOMOGRAPHY [CT] SCAN OF ABDOMEN:

CT is the most frequently used method to evaluate the stable patients with blunt abdominal trauma. The retroperitoneum is best evaluated by CT.

INDICATIONS

- Blunt trauma
- Hemo-dynamic stability
- Normal or Unreliable physical examination
- Mechanism duodenal and pancreatic trauma.

CONTRAINDICATIONS:

- Clear indications for exploratory laparotomy.
- Hemo dyanamic instability
- Agitation
- Allergy to Contrast Media

ADVANTAGES

- Adequate assessment of the retroperitoneum can be done.
- Renal perfusion can be assessed.
- Non Operative management of solid organs can be done.
- High specificity.

DISADVANTAGES:

- Requires specialized personnel.
- Time consuming.
- Hollow viscous injuries cannot be diagnosed reliably.
- High cost.

In recent studies accuracy rate in predicting the necessity of laparotomy is 95%[7].

F) DIAGNOSTIC LAPAROSCOPY:

Allows direct visualization of abdominal contents.

The major limitation is performing a comprehensive examination of entire abdomen particularly retroperitoneum. Other disadvantage is requirement of General Anaesthesia.

CONTRAINDICATION:

Suspected diaphragmatic injury - Risk of tension pneumothorax.

Injury to major blood vessels-Risk of air embolism.

SPECIFIC INJURIES

DIAPHRAGMATIC INJURY:

It can be injured by both blunt and penetrating trauma.

Penetrating injury below the nipple has an approximately 30% incidence of diaphragmatic injury.

DIAGNOSIS:

The clinical picture varies from asymptomatic to life threatening cardiac and pulmonary instability.

Chest X-ray shows mediastinal shift to opposite side with gastric fundal shadow or opaque mass in the mediastinum.

TREATMENT:

By abdominal approach – direct operative repair with non absorbable sutures. Two layer mattress suturing is done.

Occasionally large avulsions with extensive tissue loss will require polypropylene mesh to bridge the defect[11].

If seen [late presentation] after four weeks thoracotomy should be done to repair the defect.

HEPATIC INJURY:

Because of its size and location in the abdominal cavity liver is frequently injured in both blunt and penetrating injuries. Right lobe is being more commonly involved part.

Hepatic injuries result from direct blows, compression between the lower ribs on the right and the sheering at fixed points secondary to deceleration.

8.5% of wounds are managed by simple hemostasis.

DIAGNOSIS:

Clinical: Tenderness and rigidity in the right hypochondrium.

X-ray: Elevation of right dome of diaphragm. Increased haziness in the region of liver.

Fracture of lower ribs on right.

DPL: May be positive due to hemoperitoneum.

USG: Detects hemoperitoneum and liver injury.

CT used to grade the injuries.

LIVER INJURY SCALE[12]:

Grade	Type of injury	Description of injury
I	Hematoma	Subcapsular,<10% surface area
	Laceration	Capsular tear, less than 1 cm parenchymal depth
II	Hematoma	Subcapsular,10 to 50% of surface area; intraparenchymal <10cm in diameter
	Laceration	Capsular tear,1 to 3 cm parenchymal depth <10 cm in length
III	Hematoma	Sub capsular,>50% surface area of ruptured Sub capsular, or parenchymal hematoma, Intra parenchymal hematoma >10 cm or expanding.
	Laceration	3cm parenchymal depth
IV	Laceration	Parenchymal disruption involving 25-75% hepatic lobe or 1-3 couinaud segments.
V	Laceration	Parenchymal disruption involving >75% hepatic lobe or >3 Couinaud segments within a single lobe
	Vascular	Juxtahepatic Venous injuries
VI	Vascular	Hepatic avulsion

TREATMENT:

Aim:

To control bleeding .

Remove devitalized tissue.

Minor Injuries: [Grade I and II]

- Apply topical hemostatic agents.
- Suturing the liver.

Grade III , IV, V: [Bleeding controlled by Pringles manoeuvre]

- Topic hemostatic agents.
- Ligation of individual bleeding vessels after finger fracture hepatectomy along non anatomic planes.
- Closure of parenchyma with mattress sutures
- Ligation of left and right hepatic arteries.

Grade III, IV, V: [Bleeding uncontrolled by Pringles, manoeuvre]

- Clearly buttress the sutures.
- If bleeding persists pack the abdomen

  (a)If bleeding stops, close the abdomen with out drain and remove pack after.

  (b)If bleeding uncontrolled repair hepatic vein or I.V.C.

COMPLICATIONS:

- Pulmonary complications.
- Post operatives bleeding.

- Coagulopathy.
- Biliary Fistula.
- Hemobilia-7% to 10%
- Subdiaphragmatic and intraparenchymal abscess formation –72%

MORBIDITY AND MORTALITY:

Overall mortality rate-8 to 10%

Morbidity rate-18 to 30%

Indications for non operative treatment of liver injury.

- Hemodynamic stability.
- Normal Mental Status.
- Absence of a clear indication for laparotomy.
- Low grade liver injuries.
- Requirements of less than two units of blood transfusion.

Angiographic embolization has been added to the protocol of non operative management of liver injuries in an attempt to decrease the necessity of blood transfusion and the number of operations.

SUCCESS RATE:

In Grade 1-3 injuries it approaches 95%.

In Grade 4-5 injuries if it is around 75 to 80%.

SPLENIC INJURY:

Deceleration type of motor vehicle accident, direct blow to the left lower ribs or left upper quadrant of abdomen are common modes of injuries to spleen.

Spleen remains the most commonly injured organ in blunt abdominal trauma because of its mobility, its attachment to many structure in the left hypochondrium and its position and intimate contact with lower ribs. Spleen is relatively free to continue movement in patients who suffered deceleration type trauma and this leads to capsular tear at the attachment and possible fracture by contact with convex outer dome against the posterior lower ribs.

PHYSICAL FINDINGS:

- Modest hypotension.
- Signs of peritonitis in the left hypochondrium.
- Kehr's sign-pain at tip of the shoulder in less than 50%
- Balance sign.

Some patients present with signs and symptoms of Splenic rupture sometimes after original injury. This period is the latent period of BAUDET, reason for this is the delayed rupture of large subcapsular hematoma.

INVESTIGATIONS:

- X-ray.
- DPL- Highly sensitive
- USG detects hemoperitoneum and visualize the solid organs.
- CT-Used in stable patients.

SPLENIC INJURY SCALE[12]:

Grade	Type of injury	Description of injury
I	Hematoma	Subcapsular,<10% surface area
	Laceration	Capsular tear, <1 cm parenchymal depth
II	Hematoma	Subcapsular,10 to 50% of surface area; intraparenchymal <5cm in dia
	Laceration	Capsular tear,1 to 3 cm parenchymal depth that does not involved a trabecular vessel.
III	Hematoma	Subcapsular,>50% surface area or expanding; ruptured Subcapsular, or parenchymal hematoma, intra parenchymal hematoma >5 cm or expanding.
	Laceration	>3cm parenchymal depth or involved in trabecular vessels.
IV	Laceration	Laceration involving segmental or hilar vessels producing major Devascularization (>25% of spleen).
V	Laceration	Completely shattered spleen
	Vascular	Hilar vascular injury that devascularizes spleen

Splenic injuries are treated non operatively, by splenic repair, by partial splenectomy or resection depending on the extent of injury and the condition of the patient[13 14].

Enthusiasm for splenic salvage has been driven by the evolving trend towards non operative management of solid organ injuries and the rare but often fatal complications of overwhelming post splenectomy infection (OPSI)[15].

TREATMENT:

GRADE I AND II:

CAUTERY :

Electrocautery

Argon beam coagulation.

SUPERFICIAL HEMOSTATIC AGENT:

- Oxidized cellulose
- Absorbable gelatin sponge.
- Topical thrombin.

ALL GRADE III INJURY AND GRADE II INJURY NOT CONTROLLED BY SUPERFICIAL HEMOSTATIC AGENTS:

Suture repair with the help of pledget.

ALL GRADE IV INJURY AND GRADE III INJURY NOT CONTROLLED BY SUTURING

Mesh wrapping:

- Vicryl mesh
- Polypropylene mesh.

GRADE III AND IV MAJOR UPPER OR LOWER INJURIES:

- Resectional debridement.

SPLENIC HILAR INJURY:

Splenectomy.

GALL BLADDER / COMMON BILE DUCT INJURIES:

Injury to extrahepatic biliary system can be caused by either penetrating or blunt trauma.

Common bile duct: Upto 25-50% circumferential injuries primary repair and T tube drain attempted.

>50% of circumferential injuries - Roux en Y choledocho jejunostomy with single layer interrupted 5/0 absorbable monofilament.

PORTAL VEIN:

Partial Laceration

Lateral Venoraphy with 5/0 prolene.

Complete Transaction:

End to end anastomosis

Grafting

1. Jugular vein.
2. Splenic Vein
3. Gortex vascular graft.

PANCREATIC INJURY

Rare amounting for 10-20% of all abdominal injuries mostly by penetrating trauma. The presence of a pancreatic duct injury appears to be a key factor in postoperative morbidity[16].

DIAGNOSIS:

Isolated pancreas injury is rare. Seat belt sign may be clinically evident. Increased serum or urinary amylase after blunt injury is not diagnostic.

Contrast duodenography – Widening of c-loop.

CT has major role in evaluating pancreatic injury.

PANCREATIC INJURY SCALE:

Grade	Type of injury	Description of injury
I	Hematoma	Minor contusion without duct injury.
	Laceration	Superficial laceration without duct injury.
II	Hematoma	Major contusion without duct injury or tissue loss.
	Laceration	Major laceration without duct injury or tissue loss.
III	Laceration	Distal Transection or Parenchymal injury with duct injury.
IV	Laceration	Proximal Transection or Parenchymal injury involving ampulla
V	Laceration	Massive Disruption of Pancreatic head.

TREATMENT:

GRADE I AND II:

- Deroofing and maintaining hemostasis (or) evacuation and closed drainage.

GRADE III:

- Distal pancreatectomy with or without splenectomy. If duct injured and not truncated treatment is by Roux-en Y drainage.

GRADE IV:

Diabetic with intact duodenal ampullary complex.

- Closure of duodenal rim of laceration.

- Roux –en –Y pancreatic jejunostomy.

Non Diabetic - Primary closure of proximal pancreas and distal pancreatectomy.

GRADE V:

Unstable – duodenal diversion and external drainage.

Stable - Pancreatico duodenectomy (or) Roux – en- Y pancreatico jejunostomy.

COMPLICATION:

Pancreatic Fistula: 35-40%

Abscess:35-40%

Pancreatitis:8-18%

Mortality Rate- 10-25% (Mostly due to associated injuries)

MESENTRIC HEMATOMA:

All mesenteric hematoma should be explored because these can hide bowel injury.

COMPLICATION:

Enteric leakage.

Intra abdominal abscess.

Short bowel syndrome.

INJURIES TO DUODENUM:

- The majority of duodenal injuries are caused by penetrating injuries.
- Incidence varies from 3 to 5%
- Most duodenal injuries are accompanied by other intra abdominal injuries.
- The retroperitoneal location of the duodenum (second and third positions) exerts a protective effect against injuries but also prevents an early diagnosis.
- A thorough search based on mechanism of injury is necessary to prevent delay in diagnosis.

PLAIN FILM OF THE ABDOMEN:

- Mild scoliosis
- Obliteration of right psoas shadow
- Absence of air in the duodenal bulb
- Air in the retroperitoneum outlining the kidney.

The radiological finding of duodenal hemotoma (Coil spring or stacked coin sign) is not an indication for laparotomy.

DEFINITIVE DIAGNOSIS REQUIRES:

- Gastrografin upper gastrointestinal series or CT of the abdomen with oral and intravenous contrast.

  DPL-Unreliable in detecting retroperitoneal injuries.

Duodenum Injury Scale[19]:

Grade	Type of injury	Description of injury
I	Hematoma	Involving single portion of duodenum
	Laceration	Partial thickness, No perforation
II	Hematoma	Involving more than one portion of duodenum
	Laceration	Disruption < 50% of circumference
III	Laceration	Disruption 50-75% of circumference of D2 Disruption 50-100% of circumference of D1,D3,D4
IV	Laceration	Disruption >75% of circumference of D2 involving ampulla or distal common bileduct
V	Laceration	Massive disruption of duodeno pancreatic complex.
	Vascular	Devascularization of duodenum.

Intraoperative evaluation of the duodenum requires an adequate mobilization of duodenum by means of a Kocher's maneuver

The appropriate repair of duodenal injuries depends on injury severity and elapsed time from injury.

Grade I and II diagnosed within – 6 hours of injury - simple primary repair

After 6 hours - any form of duodenal decompression.

Grade III injuries- are best treated by primary repair, pyloric exclusion and drainage (or) by Roux en-Y duodenojejunostomy.

Grade IV injuries are difficult to repair

- primary repair of duodenum
- repair of common bile duct.
- placement of tracheostomy tube with long transpapillary limb.

GRADE V:

- Pancreaticoduodenectomy

Duodenal hematomas are expected to resolve between 10 to 15 days and management consists of nasogastric suction until Peristalsis resumes**.** Exploration is indicated in the event of persistent duodenal obstruction.

COMPLICATIONS:

The incidence of complications after duodenal injuries is high ranging from 30% to more than 100%[20].

- Duodenal Fistula
- Abscess formation.

SMALL BOWEL INJURIES:

The small bowel is the most frequently injured organ after penetrating injuries. After blunt trauma the incidence ranges from 5 to 20%

The postulated mechanism involved in blunt injuries include.

- Crushing injury to bowel.
- Deceleration shearing of the small bowel at fixed points
- Closed loop rupture caused by sudden increase in intra-abdominal pressure.

DIAGNOSIS:

Sign of peritonitis.

X ray –free air under diaphragm

DPL-Not reliable.

CT –intravenous and oral contrast.

SMALL BOWEL INJURY SCALE: (BY OIS COMMITTEE OF AAST, 1990)

Grade	Type of injury	Description of injury
I	Hematoma	Contusion or Hematoma without devascularization.
	Laceration	Partial thickness, No perforation
II	Laceration	Laceration < 50% of circumference
III	Laceration	Laceration> 50% of circumference without transaction
IV	Laceration	Transection of small Bowel.
V	Laceration	Transection of small Bowel, with segmental tissue loss
VI	Vascular	Devascularized segment.

TREATMENT:

At laparotomy a careful examination of the entire small bowel should be performed. Primary repair is under taken after controlling the bleeding .The principle being wide debridement of all devitalized tissue, liberal irrigation and restoration of bowel continuity and function.

COMPLICATIONS:

Hemorrhage

Wound infection

Anastamotic failure

Fistula

Abscess and obstruction.

INJURIES TO COLON:

Colon injuries are usually the result of penetrating trauma. Morbidity and mortality rate after colonic injuries ranges from 20 to 35% and 3 to 15% respectively.

DIAGNOSIS:

-Physical examination-signs of peritonitis

-X ray abdomen – pneumoperitoneum

-DPL

-Triple contrast CT.

COLON INJURY SCALE [BY OIS COMMITTEE OF AAST,1990]:

Grade	Type of injury	Description of injury
I	Hematoma	Contusion or Hematoma without devascularization.
	Laceration	Partial thickness, No perforation
II	Laceration	Laceration < 50% of circumference
III	Laceration	Laceration> 50% of circumference without transection
IV	Laceration	Transection of colon.
V	Laceration	Transection of colon, with segmental tissue loss

TREATMENT:

Primary repair

-Criteria for primary repair are

1.<6 hrs interval from injury

2.Less than two associated intraperitoneal injuries.

3.Absence of hemorrahagic shock.

4.Absence of colonic vascular injury.

-Exteriorization colonic repair.

-Diversion colostomy.

INJURIES TO RECTUM:

- Rectal injuries are uncommon. Most result from gunshot wounds.
- Rectal injuries can be intraperitoneal or extraperitoneal.

DIAGNOSIS:

Physical examination-may reveal blood (or) an injury may be palpable.

Anoscopy and rigid proctosigmoidoscopy.

TREATMENT:

Primary closure of extraperitoneal rectal injuries should be attempted.

A diverting colostomy, washout of distal rectal stump and wide presacral drainage.

COMPLICATIONS:

- Sepsis
- Pelvic abscess
- Urinary (or) Rectal fistula.
- Rectal incontinence and stricture
- Loss of sexual function
- Urinary incontinence.

RENAL INJURIES:

Kidney is the most commonly injured part of urinary tract. Severity of organ injury correlates with the need for operative intervention[17].

DIAGNOSIS:

Clinical – hematoma

Ultrasound-helps to detect the injury.

Compound Tomography-Helps in grading.

Intravenous Pyelogram-For confirmation and assessing the renal status.

KIDNEY INJURY SCALE:

Grade	Injury	Description
I	Contusion	Microscopic (or) gross hematoma urological Studies normal.
	Hematoma	Subcapsular,nonexpanding without parenchymal laceration.
II	Hematoma	Non expanding perirenal Hematoma Confined to renal retroperitoneum.
	Laceration	<1.0 cm parenchymal depth of renal cortex without urinary extravasation.
III	Laceration	>1.0 cm parenchymal depth of renal cortex Without collecting system rupture(or) urinary extravasation.
IV	Laceration	parenchymal laceration extending through The renal cortex, medulla and collecting System.
	Vascular	Main renal artery (or) vein injury with Continued hemorrhage.
V	Laceration	Completely shuttered kidney.
	Vascular	Avulsion of renal hilum which Devascularizes the kidney.

TREATMENT:

(a) If the patient is unstable or having expanding or pulsatile hematoma, do on the table Intravenous pyelogram and explore the kidney for reconstruction. If there is major renal injury or patient is exanguinated from other injuries, proceed with a nephrectomy.

(b) If patient is stable with systolic BP>90 mm Hg and has microscopic hematuria following blunt trauma, without any other associated injury repeat urine examination after three weeks.

(c) If patient is stable following blunt trauma(gross hematuria, systolic BP<90 mm Hg, patient not adult) and in patients with penetrating trauma do an Intravenous pyelogram , grade the injury and then treat accordingly.

Grade I, II and III and IV (With no other indications for laparotomy):

- Bed rest.
- Remove Foleys once the urine is normal.
- Watch for delayed bleeding
- Consider selective embolization.

Grade III and IV with indications for laparotomy for some Other injuries:

- Explore the kidney.

Reconstruction of all renal units if there is major renal injury or the patients general condition is worsening, do a nephrectomy.

URETERIC INJURIES

It is uncommon, occurs mostly after penetrating injury.

DIAGNOSIS:

- Intra venous pyelography
- Retrograde Ureterography.

TREATMENT:

- Adequate debridement
- Tension free repair
- Spatulated anastomosis
- Ureteral anastomosis
- Stenting and drainage

URINARY BLADDER INJURY

- Most bladder injuries are due to blunt trauma usually associated with pelvic fracture.
- Approximately 70% of patients with bladder rupture have pelvic fracture.
- Hematuria is most frequent sign.
- Extra peritoneal rupture-perforation by bony fragment
- Intraperitoneal rupture-when full bladder sustains a blow

DIAGNOSIS:

Diagnosis is made by cystography, computed tomography, or during laparoscopy.

Post void film needed to identify lateral or posterior wall injuries[18]

TREATMENT:

Intra Peritoneal Rupture

- Three layer closure
- Supra public cystostomy

Extra Peritoneal Rupture

- Primarily non operative having Foleys in place for 10-14 days
- Once the retroperitoneal bleeding is controlled delayed repair is done

Complication:

- Hemorrhage
- Urinoma
- Abscess formation
- Sepsis

URETHERAL INJURY

Found mostly in men either with pelvic fracture or with straddle injury. 10% of pelvic fractures are associated with posterior urethral injuries. Anterior urethral injury is associated with straddle injury.

DIAGNOSIS :

- Pelvic fracture
- Perineal hematoma
- Blood at urethral meatus
- Overriding of prostrate
- Retrograde urethrogram

TREATMENT:

- Bladder decompression
- Delayed urethroplasty

RETROPERITONEAL HAEMORRHAGE

They are caused by both blunt and penetrating injuries

Managements depend upon

1. Aetiology
2. Location
3. Associated injuries

Retroperitoneum is divided into three zones:

Zone 1 - Central retroperitoneal hematoma associated with pancreaticoduodenal injuries and abdominal vascular injuries

Zone 2 - Flank or perinephric hematoma

Zone 3 - Confined to pelvis

Treatment:

Zone 1 - Explore regardless of aetiology since high incidence of injury to vital structure and high morbidity and mortality

Zone 2 - Due to penetrating injury : Explored if

1. Injury is adjacent to colon
2. Expanding hematoma
3. Computed tomography demonstrates major renal injury

Due to blunt injury : Explored if

1. Expanding
2. Any abnormality in Intravenous

pyelogram or computed tomography explore and repair

Zone 3 - Due to penetrating injury is explored to find out any major vessel injury.

- Due to blunt injury should not be explored.

NEWER CONCEPTS

ABBREVIATED LAPAROTOMY:

This includes rapid access to peritoneal cavity , bleeding control and repair of injured organs. This sequence results in definitive repair of most lesions and is appropriate for most patients , but multivisceral injuries and exsanguinated patients are bad candidates for major reconstruction and time consuming reconstruction.

The most common cause of death for trauma patients are head injury, exsanguination from cardio vascular injuries, and sepsis with multi organ failure.

Another cause of death has become apparent as the capability of delivering massive quantities of red blood cells and other components developed. Surgeons are now able continue to operate on the most severely injured patients until constellations of metabolic derangements developed. These are characterized by triad of an obvious coagulopathy, profound hypothermia and metabolic acidosis.

The physiological environment is important for understanding damage control strategy. The heat loss during procedures is sometimes worsened by massive transfusion and cool IV Fluids leading to hypothermia. Hypothermia in turn leads to coagulopathy due to platelet dysfunction. Heat loss appears to be the central event since neither of the other two components can be corrected until core temperature returns to normal.

Laboratory and mathematical heat exchange models have demonstrated that evaporative heat loss from an open abdomen is by far the greatest source.

This is the rationale for the immediate abdominal closure and the reason it has been successful.[21,22]

The planned intervention is made 24 to 28 hours after initial intervention.

Indications for Damaged Control Strategy are:

- Bleeding caused by coagulopathy.
- Hypothermia during operation.
- Inability to control Hemorrhage.
- Inability to close the abdominal cavity formally.

The key is the early decision.

The rationale for damage control Procedure is:

- Initial operation.
- Resuscitation at ICU .
- Planned reoperation.

In the initial intervention the surgeon does minimum to save the life. The technique is focused on hemorrhage and contamination to stop bleeding and control intestinal leak respectively.

After the abbreviated procedure patient is resuscitated at ICU.

ABDOMINAL HYPERTENSION:

It was first described by Richardson & Trinkle in 1976.When the abdominal intra caval pressure increases to 10mm Hg they noticed a decreased venous return and when it was >25 mmHg, airway pressure increased.

With small bowel edema, either retention sutures on the abdominal wall or suturing the skin and leaving the fascia open can be done.

Sometimes closure is impossible. In that cases a Plastic bag (BAGOTA'S BAG) or soft mesh can be used.

Abdominal hypertension caused by trauma or laparotomy can result in abdominal compartment syndrome characterized by respiratory, hemodynamic and renal problems.

Clinical Features:

- Tensly distended abdomen.
- Depressed cardiac output.
- Hypoxia due to increased air way pressure.
- Oliguric renal failure.

Confirmation:

- Measuring the intra abdominal pressure by needle.
- Determination of urinary bladder pressure.

Treatment:

- Immediate decompression.
- Performing a temporary closure.

MATERIALS AND METHODS

The study was conducted in Government Chengalpattu Medical College Hospital, Chengalpattu for a period of 2 yrs and 6 months.

The study comprises of patients who sustained blunt abdominal injury who were admitted and managed in our hospital.

All patients were received in the casualty department by the casualty medical officer and the duty general surgeon was called to attend the patients. All the cases were registered as medico legal cases.

After primary survey of these patients, brief history and complete physical assessment all the basic investigations were done.

Skiagrams were taken routinely. Ultra sonogram (F.A.S.T SCAN) was done for all cases and CT scan was done for selected cases.

Peritoneal tapping was done for all cases and Diagnostic peritoneal Lavage was done for few cases of clinically equivocal abdomen.

Based on the clinical finding and investigations cases were managed.

At laparotomy, a systematic approach with examination of all intra abdominal organs were made. After surgery patients were managed with Nasogastric tube, IV fluids and antibiotics.

Post operative complications were specifically looked for.

DISCUSSION

During the period of study from June 2005 to august 2007,53 cases of blunt abdominal trauma were admitted and managed at Government Chengalpattu Medical College Hospital, Chengalpattu.

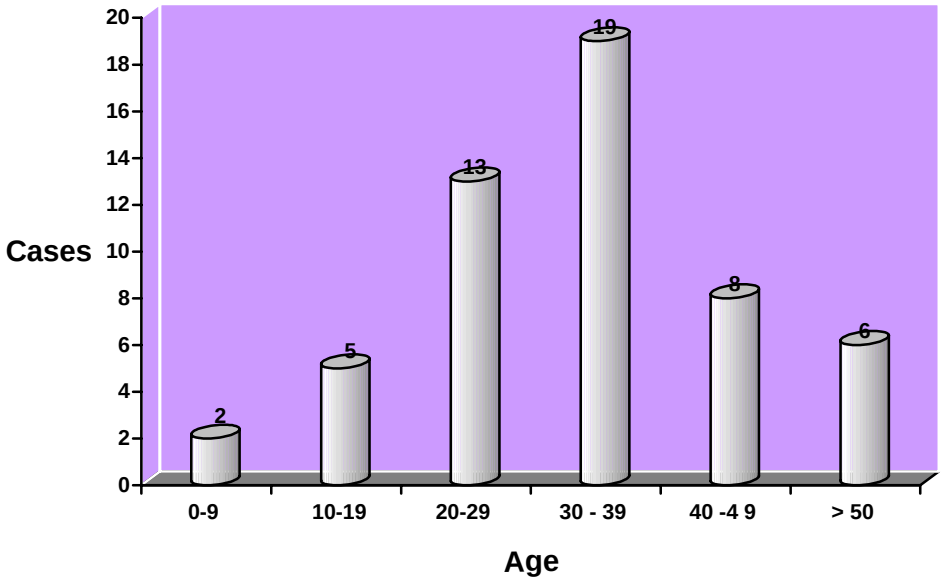
AGE INCIDENCE:

The highest age incidence for abdominal injury was for age group 30-39 years which constitutes 35.85% of the study population followed by those in the age group 20 – 29 years both accounting for about 60% of total.

TABLE – 1

TABLE SHOWING AGE INCIDENCE

Age (Years)	No. of Cases	Percentage (%)
0 – 9	2	3.77
10 – 19	5	9.43
20 – 29	13	24.53
30 – 39	19	35.85
40 – 49	8	15.09
> 50	6	11.32



Comparison table of age No. of Cases incidence in various studies.

Various Study	Present Study	Fakhry et al 2000	Kafie F et al 1997
Mean age at presentation (in years)	34.5	35.2	34.5

Hence mean age in various series was in third decade, which corresponds well with present study.

SEX INCIDENCE:

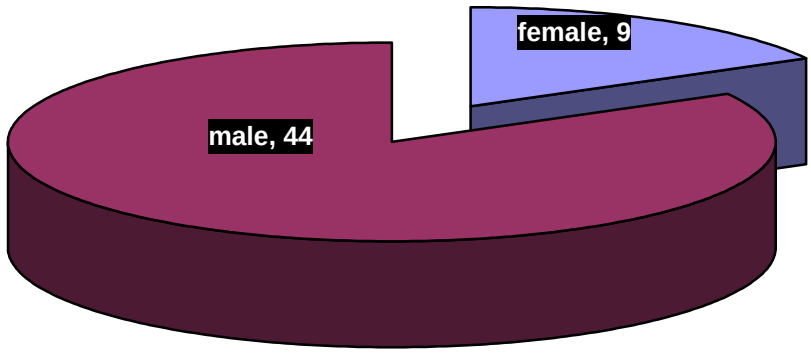
The following table shows the distribution of blunt injury abdomen among males and females.

TABLE – 2

TABLE SHOWING SEX INCIDENCE

Sex	No. of Cases	Percentage (%)
Female	9	16.99
Male	44	83.01

SEX INCIDENCE



COMPARISON TABLE OF SEX INCIDENCE IN VARIOUS STUDIES

STUDY	MALE VICTIM (%)	FEMALE VICTIM (%)
PRESENT	83.01	16.99
KUNNIN N et al 1994	83.3	16.7
KAO H et al 1993	82.9	17.1

Males were commonly injured in all studies and the same was seen in present study. Hence it can be concluded that males are usually common victims of injuries than females.

MODE OF INJURY:

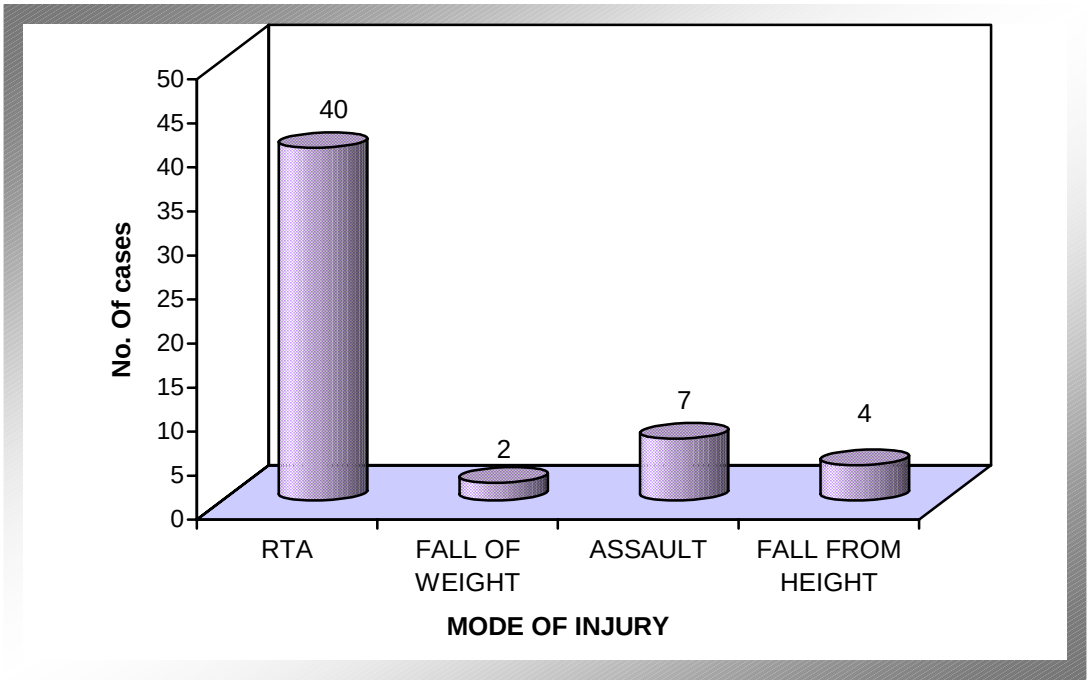
Of the 53 patients who sustained blunt injuries, 40 were due to Road traffic accidents and the rest were due to other causes such as wall collapse, assault and fall from height.

TABLE – 3

TABLE SHOWING VARIOUS MODES OF INJURY

BLUNT INJURY

Mode of Injury	No of cases	Percentage (%)
RTA	40	75.47
Fall of weight	2	3.77
Assault	7	13.21
Fall From height	4	7.56



SPECIFIC ORGAN INJURY:

The various organs injured in blunt abdominal trauma were studied and the results were tabulated.

TABLE – 4

TABLE SHOWING SPECIFIC ORGAN INJURY IN BLUNT TRAUMA

Organ	No. of Cases	Percentage (%)
Spleen	19	35.84
Liver	11	20.75
Bladder	1	1.89
Bowel	9	16.98
Retro peritoneal hematoma	2	3.77
Mesentery	4	7.55
Pancreas	1	1.89
Kidney	3	5.66
Diaphragm	1	1.89
Others	2	3.77

In the case of blunt injury to abdomen, Spleen is the most commonly injured organ followed by liver.

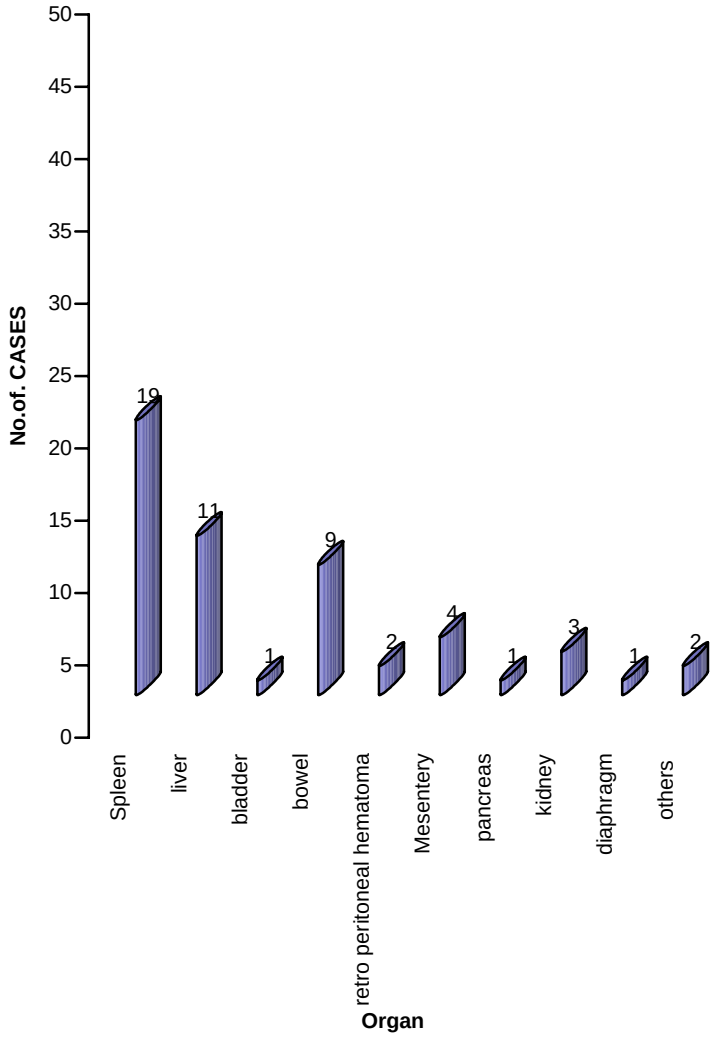


TABLE - 5

COMPARISON STUDY OF SPECIFIC ORGAN INJURIES IN BLUNT ABDOMINAL INJURY

Organs injured	Blansdell and Trunky et al (%)	Present Study (%)
Spleen	25	35.84
Kidney	12	5.66
Intestine	12	16.98
Liver	15	20.75
Retroperitoneal hematoma	13	3.77
Mesentery	5	7.55
Pancreas	3	1.89
Diaphragm	2	1.89
Bladder	6	1.89

SPLENIC INJURIES

In our study we encountered grade –II splenic injuries in majority (9 cases).Six cases involved laceration of parenchyma <3cm depth and three cases were subcapsular hematoma (>10%<50%). All cases were taken up for laparotomy ending in splenectomy. Six cases of grade- III injuries were seen with laceration involving >3cm depth (4 cases) and expanding hematoma (2 cases) Splenectomy was done for all the cases. Only one case of grade – IV type was seen with hilar vessel laceration and two cases of grade-5 injury with shattered spleen were met

with. All these cases with severe injuries were managed by splenectomy. Only one case of grade-1 injury was come across with a small subcapsular hematoma. Patient was stable during admission and so he was put on conservative management .Patient improved well and the hematoma resolved during discharge.

All the patients who underwent splenectomy were given pneumococcal vaccine in the post operative period.

TABLE - 6

TABLE SHOWING SPLENIC INJURIES ENCOUNTERED IN PRESENT STUDY

INJURY		NO.OF CASES	PERCENTAGE (%)	MANAGEMENT	
GRADE	TYPE			CONSERVATIVE	LAPAROTOMY
I	HEMATOMA	1	5.26	1	_
	LACERATION	_	_	_	_
II	HEMATOMA >10%<50%	3	15.79	_	3
	LACERATION <3cm depth	6	31.58	_	6
III	HEMATOMA (expanding)	2	10.53	_	2
	LACERATION >3cm depth	4	21.05	_	4
IV	LACERATION Hilar vessel	1	5.26	_	1
V	SHATTERED SPLEEN	2	10.53	_	2
	PEDICLE AVULSION	–	–	–	–

LIVER INJURIES

We encountered 11 cases of liver injury of which grade-II injuries constituting the majority(5 cases) followed by grade - I injuries (4 cases) . Two

cases were of grade – III in nature. All grade-I injuries involving either a small Subcapsular hematoma (2) or capsular tear with laceration < 1 cm depth in parenchyma (2).All these injuries were managed conservatively and patients did well. Of the 5 cases of grade-II injuries ,two cases with subcapsular hematomas were managed on expectant lines. Both cases settled well without complications. The remaining 3 cases were taken up for laparotomy. Both had laceration of parenchyma 1-3 cm depth & < 10cm length .Primary suturing using 2-o vicryl was done keeping a gel foam in-between.

Two cases of grade –III injuries were met with. One of them was an antenatal primi at term. Emergency LSCS was done first delivering a live male baby because liver cannot be reached with a full term uterus. Liver lacerations were sutured and owing to mild ooze from the surface of the liver a roller gauze packing was done and one end brought out through a separate stab incision in the right hypochondrium. The pack was removed on 3rd post operative day. Patient improved without any complication.

The other case with grade-III injury had segmental vascular injury. Segmentectomy was done along with wrapping of raw surface with prolene mesh. Patient did well postoperatively.

TABLE – 7

TABLE SHOWING HEPATIC INJURIES ENCOUNTERED IN PRESENT STUDY

INJURY		NO.OF CASES	PERCENTAGE (%)	MANAGEMENT	
GRADE	TYPE			CONSERVATIVE	LAPAROTOMY
I	HEMATOMA <10%surface area	2	18.18	2	–
	LACERATION Subcapsular tear	2	18.18	2	–
II	HEMATOMA >10%<50%	2	18.18	2	–
	LACERATION <3cm depth	3	27.27	–	3
III	HEMATOMA (expanding)	–	–	–	–
	LACERATION >3cm depth	2	18.18	–	2
IV	LACERATION	–	–	–	–
V	LACERATION Extensive	–	–	–	–
	VASCULAR				
VI	AVULSION	–	–	–	–

BLADDER

Only one case of bladder injury was encountered. It was intra peritoneal rupture found at laparotomy. Bladder was sutured in two layers using 2-o vicryl keeping a SPC catheter. Patient recovered well and the catheter removed on 15th post operative day.

BOWEL INJURIES

Nine bowel injuries were encountered of which 6 were in small bowel (jejunum-3,ileum-3) and 3 in large bowel (ascending colon-1,descending colon-2).

All jejunal perforations were about 1cm diameter and were closed primarily in 2 layers using 2-o vicryl and 2-o silk after trimming the edges. One ileal perforation was small and was closed primarily. In two cases the defect was large involving more than two-third of the wall and hence resection of the segment with primary anastamosis were made by 2 layer method.

Three colonic perforations were encountered .All the cases presented early (within 6 hours) of injury. At laparotomy primary closure was done in single layer.

Six cases had wound infection in the post operative period and two died due to septic shock one following ileal perforation and the other following colonic perforation

TABLE - 8

TABLE SHOWING MANAGEMENT OF BOWEL INJURIES IN PRESENT STUDY

BOWEL INJURED		NO.OF CASES	PERCENTAGE (%)	MANAGEMENT	
				PRIMARY SUTURING	RESECTION ANASTAMOSIS
SMALL BOWEL	DUODENUM	-	_	_	_
	JEJUNUM	3	33.33	3	_
	ILEUM	3	33.33	1	2
LARGE BOWEL	ASC.COLON	1	11.11	1	_
	TRANS.COLON	_	_	_	_
	DESC.COLON	2	22.22	2	_
	SIGMOID	_	_	_	_

RETROPERITONAL HEMATOMA.

Two cases were met with. One was a zone -2 injury and the other zone-3 type. Both the patients were stable during admission. Conservative measures were followed and both settled to it.

MESENTRY

Four cases of mesenteric tear was encountered. All were sutured using 2-o vicryl.

PANCREAS

Only one case of pancreatic injury was come across. It was a minimal contusion of pancreas without duct injury. The patient was managed by conservative means.

RENAL INJURY

Three cases were seen. One case was grade-I injury with non expanding subcapsular hematoma. The second one was <1cm deep laceration of renal parenchyma. Both the cases were managed conservatively. There was no associated intra abdominal injury or urethral injury. Both improved well. One case was grade-V injury with shattered kidney. Nephrectomy was done on that side.

DIAPHRAGM

One case of diaphragmatic injury was met with. It was a simple tear in the muscular portion of the diaphragm on the left side. The tear was sutured and an ICD tube was inserted in the left pleural space. Patient improved well and the ICD tube was removed on 3rd post operative day.

OTHER INJURIES

Apart from the above injuries we encountered two other injuries. One was a rectus sheath hematoma. It was small and conservative measures were tried which worked. The other was an interesting case in which right ovary was injured. Right Oophorectomy was done.

SUMMARY

From the study it was found that solid organs like spleen, liver, kidney were more commonly injured in blunt abdominal injury. Of that Splenic and liver injuries formed the majority of cases. Most of the Splenic injuries were managed by splenectomy while most of the liver injuries were managed conservatively

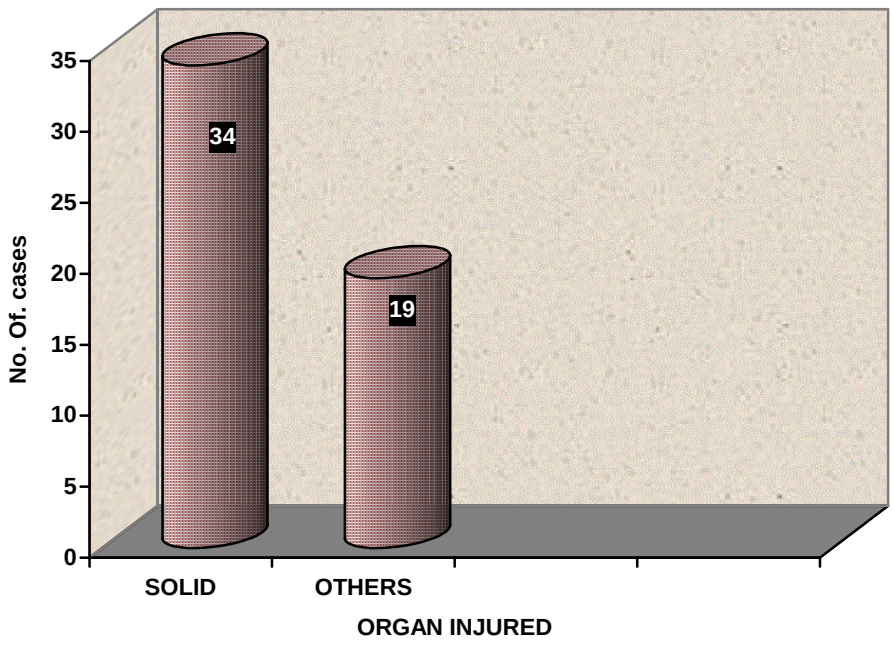
COMPARISION OF SOLID ORGAN INJURY AND OTHERS

Solid organs like spleen, liver, kidney were more commonly injured in blunt injury to abdomen than the rest of the organs like bowel, mesentery, retro peritoneum, bladder etc.,

TABLE – 9

TABLE SHOWING COMPARISON OF SOLID Vs OTHER ORGAN INJURIES

Organs injured	No. of cases	Percentage (%)
Solid	34	73.58
Others	19	26.42



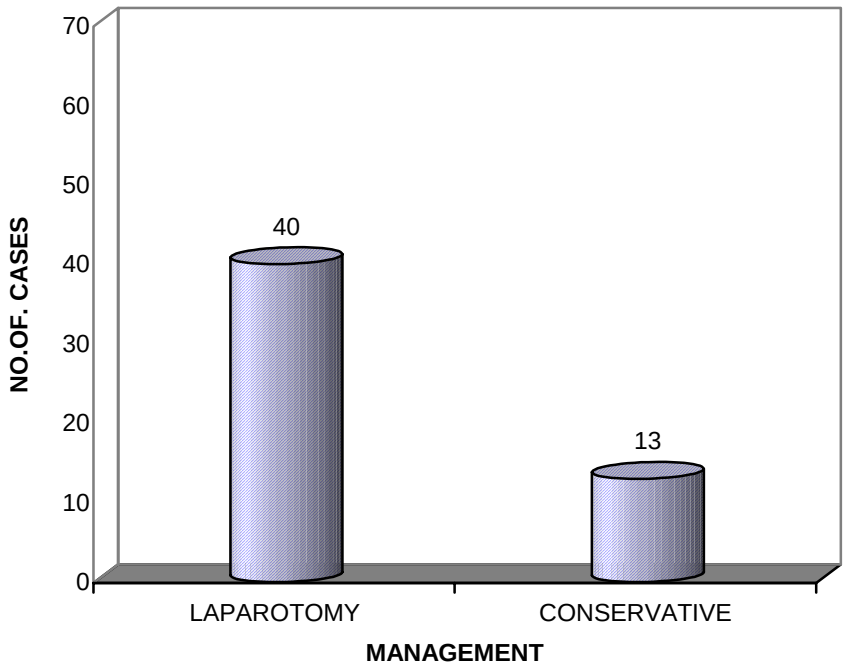
COMPARISION BETWEEN CONSERVATIVE AND INTERVENTIONAL APPROACH

Out of 53 cases, 13 cases were managed conservatively and 40 cases were taken up for laparotomy.

TABLE – 10

TABLE SHOWING COMPARISION IN MANAGEMENT

MANAGEMENT	NO. OF CASES	PERCENTAGE(%)
LAPAROTOMY	40	79.25
CONSERVATIVE	13	20.75



ANALYSIS OF CONSERVATIVE MANAGEMENT

Of the injuries managed conservatively liver injuries accounts for the majority. 6 out of 11 liver injuries were managed conservatively where as 1 out of 19 splenic injuries were managed conservatively. The case that was managed conservatively falling in the OTHERS category was a rectus sheath hematoma.

TABLE – 11

TABLE SHOWING THE DISTRIBUTION OF CONSERVATIVE MANAGEMENT

ORGANS INJURED	NO.OF CASES	PERCENTAGE (%)
LIVER	6	46.15
KIDNEY	2	15.38
SPLEEN	1	7.69
RETROPERITONEAL HEMATOMA	2	15.38
PANCREAS	1	7.69
OTHERS	1	7.69

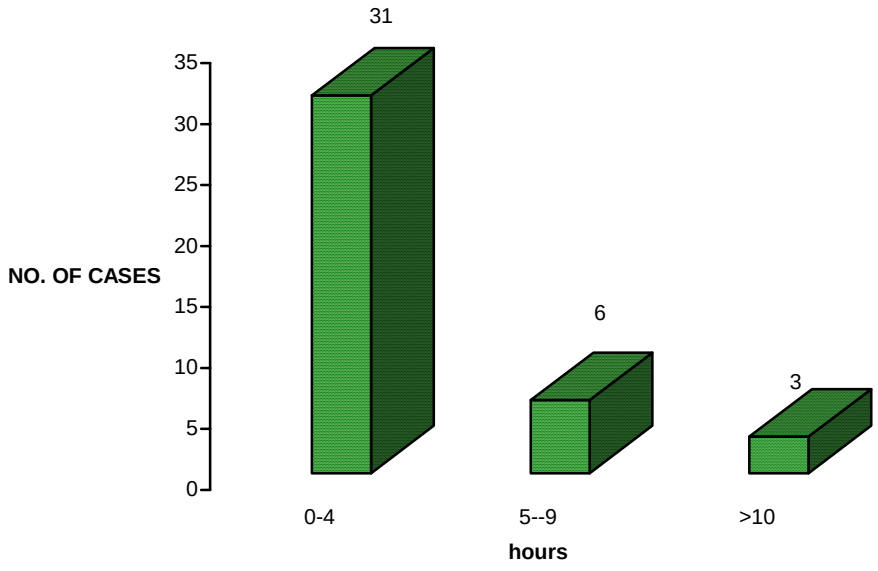
INTERVAL BETWEEN INJURY AND SURGERY

Majority of patients (31) were operated with in 4 hours of injury (77.50%). The delay in rest of the patients mostly due to delay in admission. Earlier the intervention better was the out come.

TABLE – 12

TABLE SHOWING INTERVAL BETWEEN INJURY AND SURGERY

Hours	No of cases	Percentage (%)
0-4	31	77.50
5-9	6	15
>10	3	7.5



SIGNS OF PERITONITIS

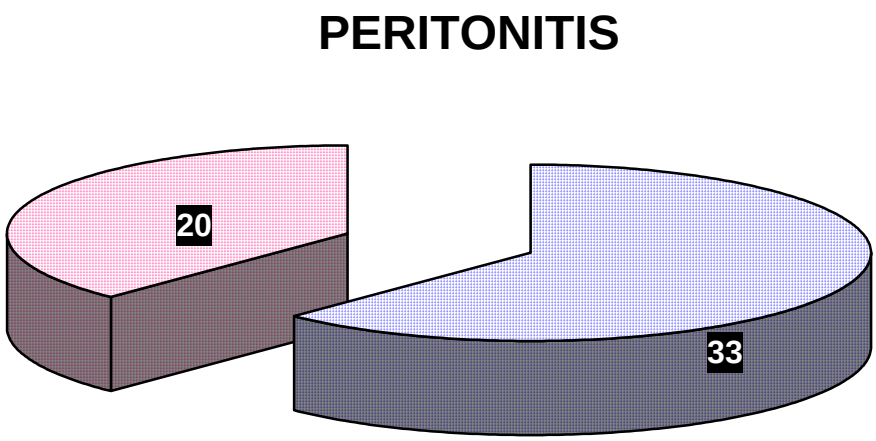
33 cases of the total 53 had signs of peritonitis at the time of presentation (62.26%). 20 cases showed no signs of peritonitis (37.74%).

TABLE – 13

TABLE SHOWING SIGNS OF PERITONITIS

Signs of Peritonitis	No. of cases	Percentage (%)
Present	33	62.26
Absent	20	37.74

Hence absence of peritonitis does not rule out abdominal injury.



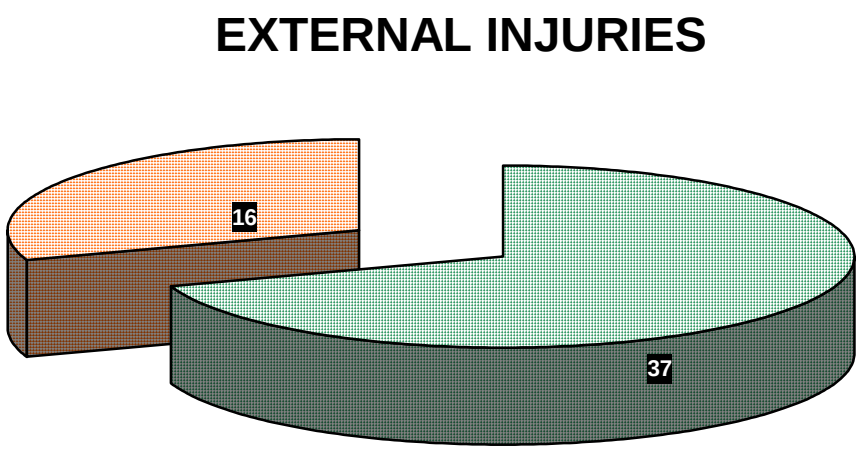
EXTERNAL INJURIES OVER ABDOMEN:

Of the 53 cases of blunt injury abdomen, 37 cases had external injuries such as contusion, abrasion , etc. over the abdomen.

TABLE – 14

TABLE SHOWING EXTERNAL INJURIES

External Injuries	No. of cases	Percentage (%)
Present	37	69.81
Absent	16	30.19



Blunt injury to the abdomen can occur without any external wounds.

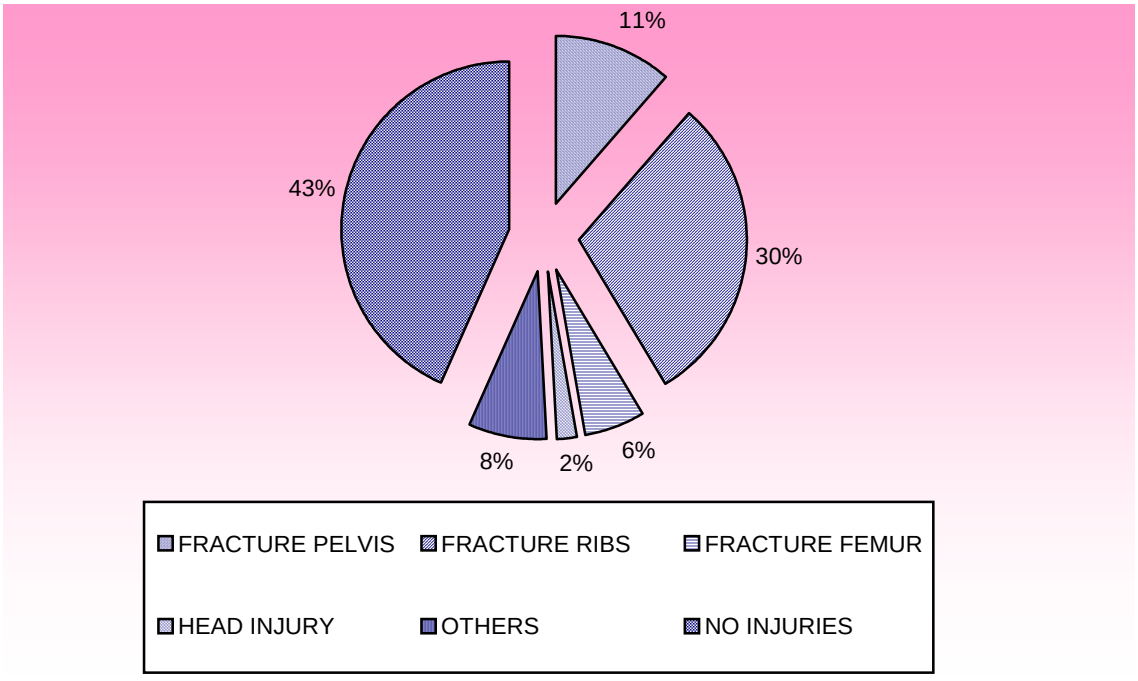
ASSOCIATED INJURIES:

19 cases had associated other injuries such as fracture pelvis, fracture ribs, femur, head injury, etc. Skeletal injuries were the most common associated injuries.

TABLE – 15

TABLE SHOWING ASSOCIATED INJURIES

Associated Injuries	No. of cases	Percentage (%)
Fracture Pelvis	6	11.32
Fracture Ribs	16	30.19
Fracture Femur	3	5.66
Head injury	1	1.89
Others	4	7.55
No injuries	23	43.40



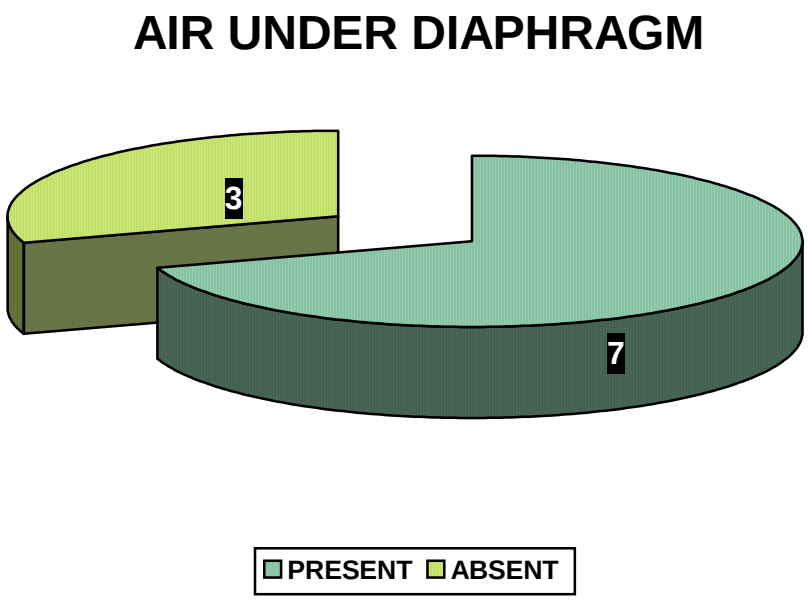
PLAIN X-RAY ABDOMEN:

Of the 10 cases of hollow viscous perforation (bowel and bladder) following abdominal trauma 7 cases showed air under diaphragm but it was not helpful in the remaining 3 cases. All the three cases had small bowel perforation of which two were in the terminal ileum and one was in the distal jejunum.

TABLE – 16

TABLE SHOWING PLAIN X-RAY ABDOMEN

Air under Diaphragm	No. of cases	Percentage (%)
Present	7	70
Absent	3	30



PERITONEAL TAPPING:

Peritoneal Tapping was done in 53 cases. In 27 cases (51%) it was positive and it was negative in 21 cases. Of the 32 cases, after conforming with other investigations and laparotomy findings it was found that in 25 cases there were positive findings and in 7 cases it was false positive. Of the cases with negative tapping true negatives were 15 and false negative were 6.

DIAGONSTIC PERITONEAL LAVAGE:

DPL was done in 15 cases of which 9 showed the positive result (60%) and in 6 cases it was negative (40%).

TABLE – 17

TABLE SHOWING RESULTS OF DPL

DPL	No. of cases	Percentage (%)
Positive	9	60
Negative	6	40

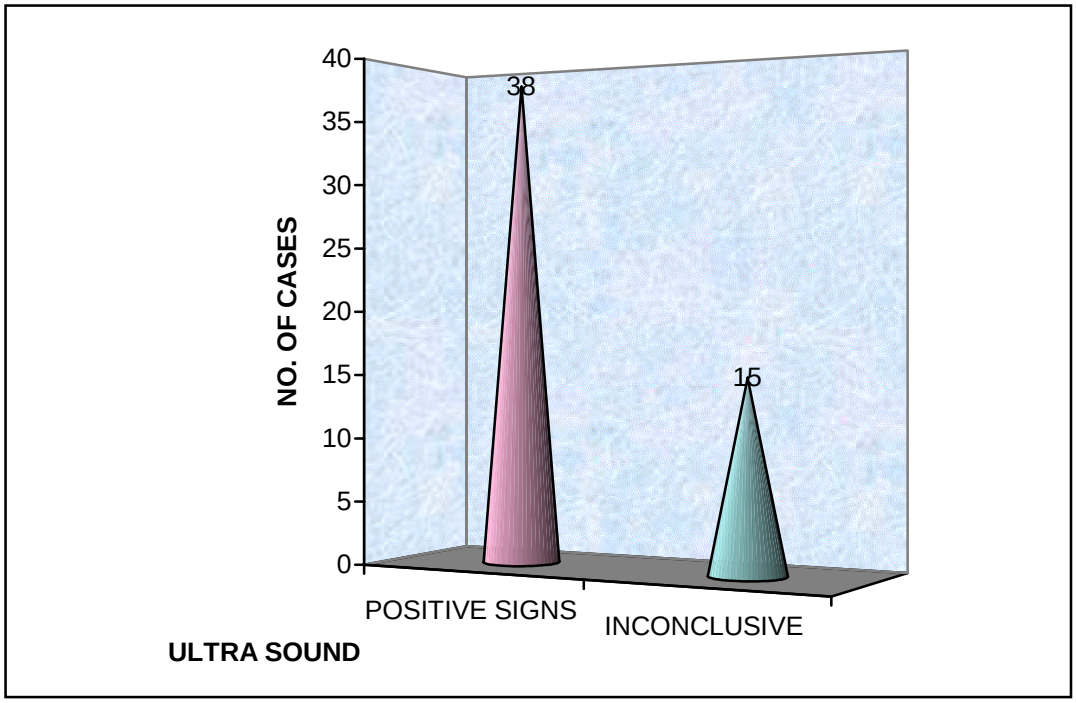
ABDOMINAL ULTRASONOGRAPHY:

FAST scan was done in all the 53 cases. In 38 cases it showed evidence of injury (71.70%) and in 15 cases (28.30%) it was inconclusive.

TABLE – 18

TABLE SHOWING RESULTS OF F.A.S.T SCAN

Ultra sound	**No. of cases**	**Percentage (%)**
Evidence of injury	38	71.70
Inconclusive	15	28.30



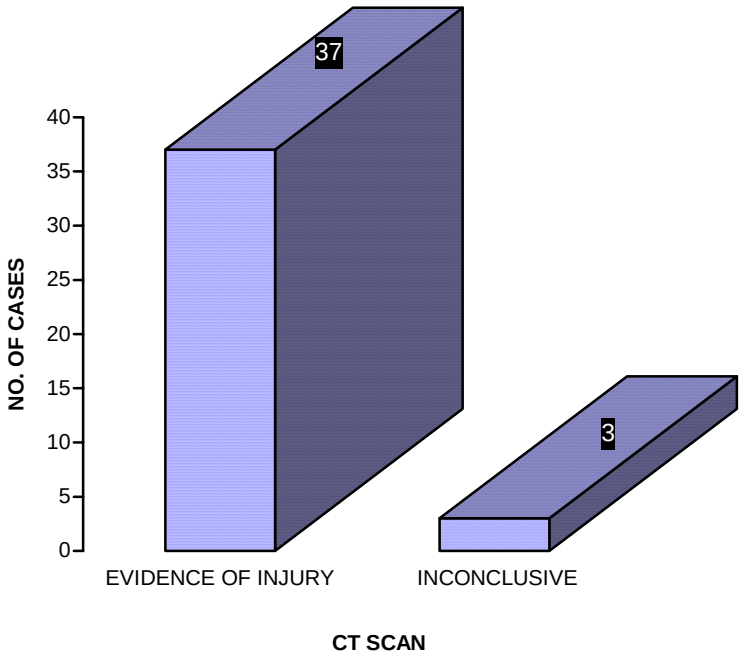
CT SCAN:

CT scan was taken for 40 patients who were stable and it was deferred in the remaining 13 cases who were in severe shock.

TABLE – 19

TABLE SHOWING RESULTS OF CT SCAN

CT Scan	No of cases	Percentage
Evidence of Injury	37	92.50
Inconclusive	3	7.50



POST OPERATIVE COMPLICATIONS

Six patients had wound infections in the post operative period. Two patients died in the post operative period due to septic shock following bowel injury. 3 patients developed other complications like DVT and respiratory infection. 42 patients recovered without any complication.

Six patients had wound infection in the post operative period. Four cases had minimal subcutaneous pus collection that was drained and wound healed well Two patients went on with wound gaping which was sutured.

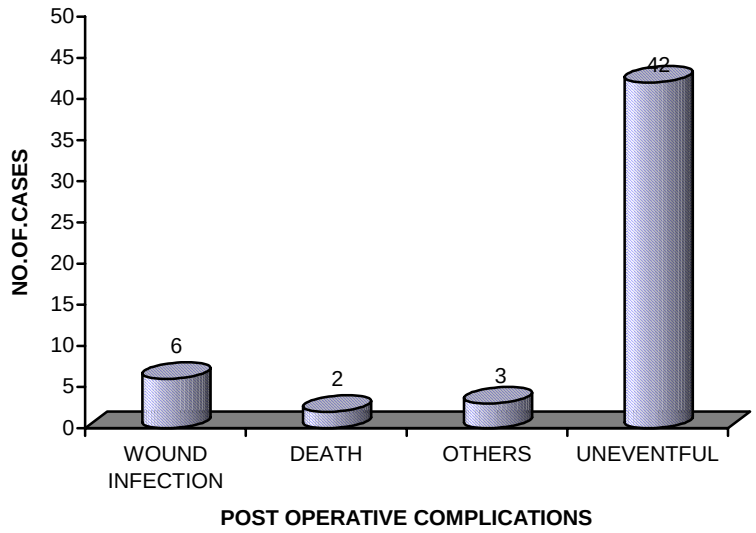
Of the two patients who died one patient developed entero cutaneous fistula on 5th post operative day. Patient's condition was not fit for surgery and hence was managed conservatively. He did not improve and died on 20th post operative day due to septic shock. The other patient presented with shock and did not recover from it and died on 4th post operative day.

Three patients developed other complications like DVT (1 case) and respiratory infection (2 cases).DVT was managed using heparin injection and compression stockings. Respiratory infection was treated with appropriate antibiotics after sputum culture and sensitivity along with chest physiotherapy.

TABLE – 20

TABLE SHOWING POST OPERATIVE COMPLICATIONS

Post Operative Complications	No. of Cases	Percentage (%)
Wound Infection	6	11.32
Death	2	3.70
Others	3	5.66
Uneventful	42	79.25



SUMMARY

53 cases of blunt abdominal injuries were studied in this series. The cases were admitted and treated in Government Chengalpattu Medical College Hospital, Chengalpattu between June 2005 to august 2007. All relevant possible investigations were done and the cases were managed. The etiology of injury, age and sex incidence, specific organs injured, investigations and treatment modalities, and the outcome were discussed.

CONCLUSION

- Hepatosplenic injuries are more common in our study accounting for nearly sixty percentage of total injuries in blunt abdominal injury.
- High index of suspicion is necessary to rule out abdominal injury especially in a polytrauma patient.
- Repeated clinical examination by same surgeon and periodic monitoring is necessary for early recognition of intra abdominal injury.
- Commonest between 30 to 39 years of age.
- Only 53.8 percent of patients with blunt injuries have external injuries over the abdomen.
- About 32.75 percent of patients have associated other injuries.
- Prompt resuscitation with simple investigations such as X-ray abdomen erect, chest X-ray, Peritoneal Aspiration / lavage are significant to decide the organ injury.
- Ultra sound is an useful adjuvant in solid organ injury.
- Spleen is the commonest organ involved in Blunt Injury accounting for 35.84 Percentage of total injuries.
- Vascular injuries are rare.
- Associated injuries to other systems needs prompt intervention.
- Mortality and morbidity are high if the time interval between injury and surgery is prolonged.
- Abdominal injuries cause very high incidence of mortality and morbidity if not recognized and intervened at the earliest.

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PROFORMA

A study of Abdominal Trauma

Case No:	IP No:	Unit :
Name:	Age:	Sex :
Religion:	Occupation:	
Address:		
Injury on:	Admission on:	Operated on:
Discharged on:	Expired on:	

Presenting Complaints:

Injury: Time: Place:

Mode-Road Traffic Accident

- Assault
- Industrial accident
- Fall
- Bull hit
- Others

Events that followed:

History of Present illness:

i) Pain Abdomen:

i) Mode of Onset Time

ii) Duration

iii) Sight

iv) Migration of pain

v) Nature

vi) Referred pain

vii) Relation to physiological act - Respiration

- Micturition

viii) Aggravating and Relieving Factors

ii) Vomiting

i) Duration

ii) Relation to pain

iii) Frequency and quality

iv) Character of act.

v) Vomitus.

iii) Distension of Abdomen:

i) Duration

ii) Uniform/Localized

iii) If localized site:

iv) Rapid/Moderate/Slow

iv) Bowel Disturbances:

- Constipation
- Bleeding per rectum
- Malena

v) Micturition Disturbances:

- Retention
- Hematuria

vi) Any other complaints and associated injuries if any

Previous History :

Personal History :

EXAMINATION :

General Physical Examination:

1) Consciousness.
2) Shock signs
3) Hydration
4) Pulse
5) Blood pressure
6) Respiratory rate
7) Anemia
8) Jaundice
9) Decubitus
10) Surgical Emphysema
11) Temperature
12) ENT bleeding

ABDOMEN:

Inspection: Shape

Skin over abdomen

Visible injuries

Prominent swelling

Hernial orifices

Movement with respiration peristaltic.

Palpation: Temperature

Tenderness.

Mass per Abdomen.

Girth of Abdomen.

Guarding.

Rigidity.

Percussion: Liver dullness

Splenic dullness

Fluid thrill

Shifting dullness

Auscultation: Bowel sounds

Bruit

External Genitalia:

Per Rectal Findings:

Associated Injuries:

- Head & Neck
- Thorax Ribs
- Spine
- Pelvis
- Extremities

Systemic Examination:

- Respiratory System
- Cardiovascular system
- Central nervous System.

PROVISIONAL DIAGNOSIS:

INVESTIGATIONS

i) Blood	Serial Hb%	TC	DC
	PCV	Grouping	Sugar
ii)Urine	Color	Clarity	Albumin
	sugar	Microscopic	
iii)Stool	Color	Occult Blood	
iv)Serum	Amylase	Bilirubin	Electrolytes.
v)Radiology	plain x ray abdomen(Erect/Supine)		
	Contrast		
	Other x rays.		

vi) Abdominal Paracentesis.

- Quantity
- character

- culture/sensitivity
- cytology
- amylase level

vii) Peritoneal Lavage:

viii) Ultrasonography

ix) CT abdomen

x) Ryle's tube aspiration

xi) Wound exploration

INDICATION FOR SURGERY:

TIME INTERVAL BETWEEN INJURY AND LAPAROTOMY:

Operative notes:

Date: Started: Closed:

Anaesthesia:

Findings:

Procedure Done:

Post operative complications:

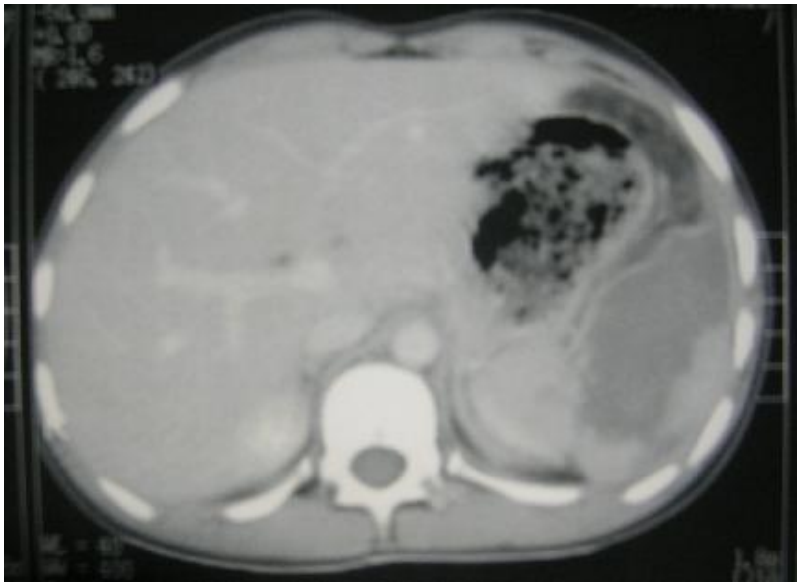
Blood Transfusion - Pre operative

- Per operative
- Post operative

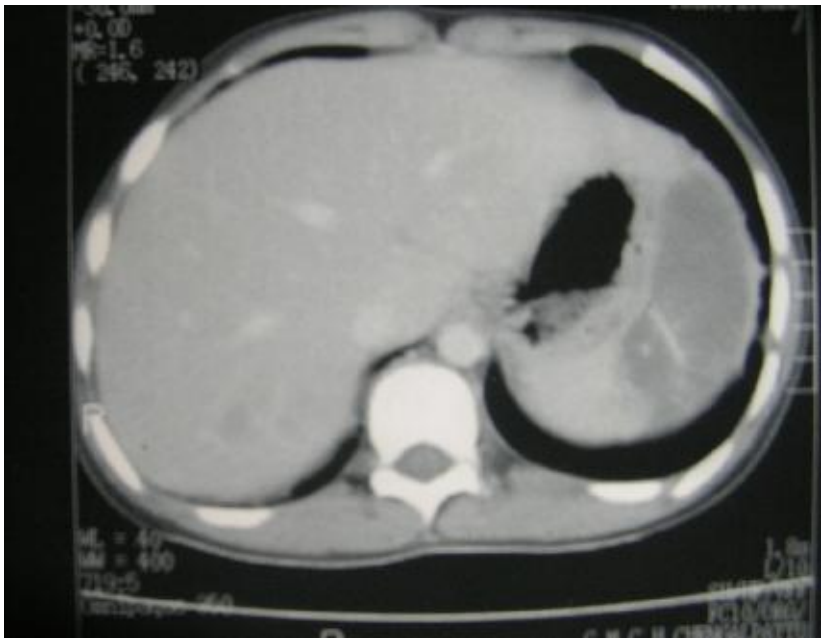
Follow Up :

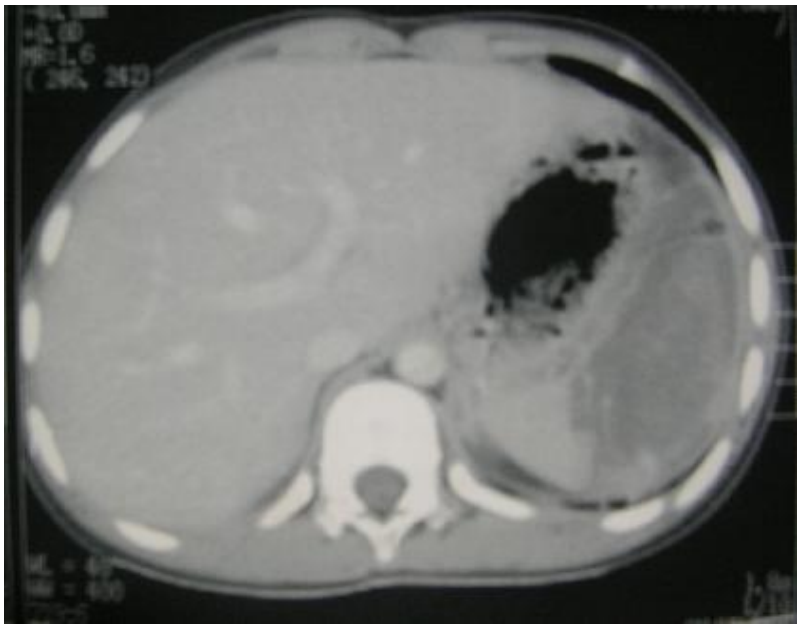
Summary :

CT SCAN OF ABDOMEN SHOWING SPLENIC INJURY

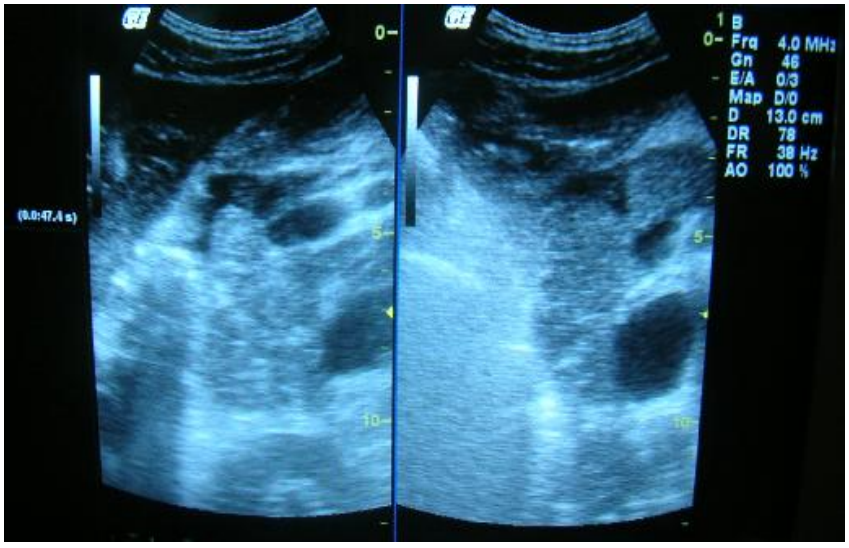


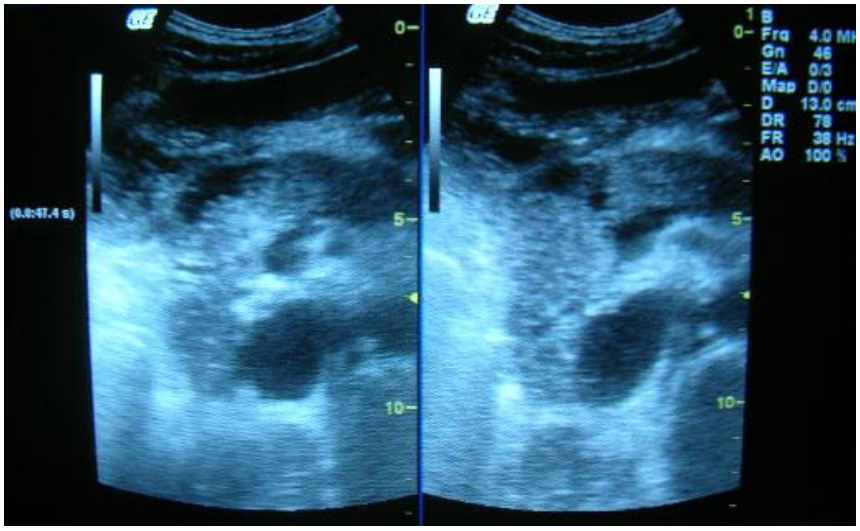
CT SCAN OF ABDOMEN SHOWING SPLENIC INJURY



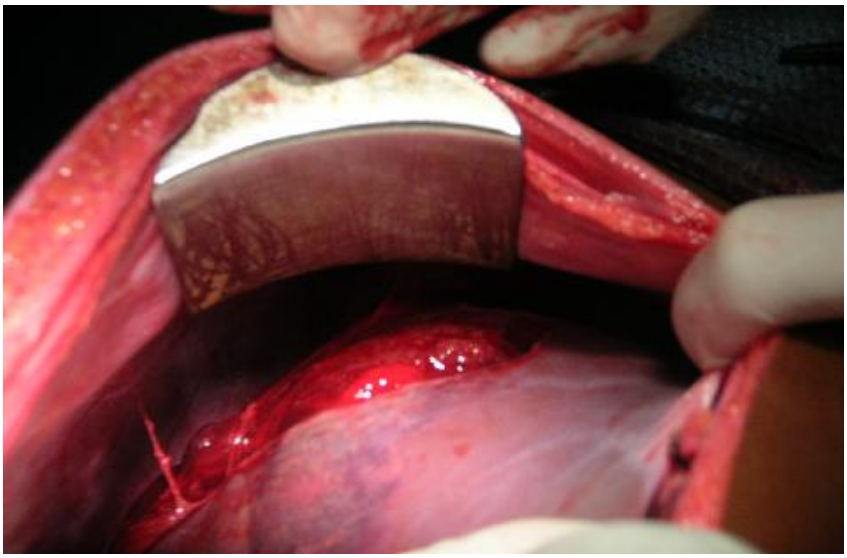


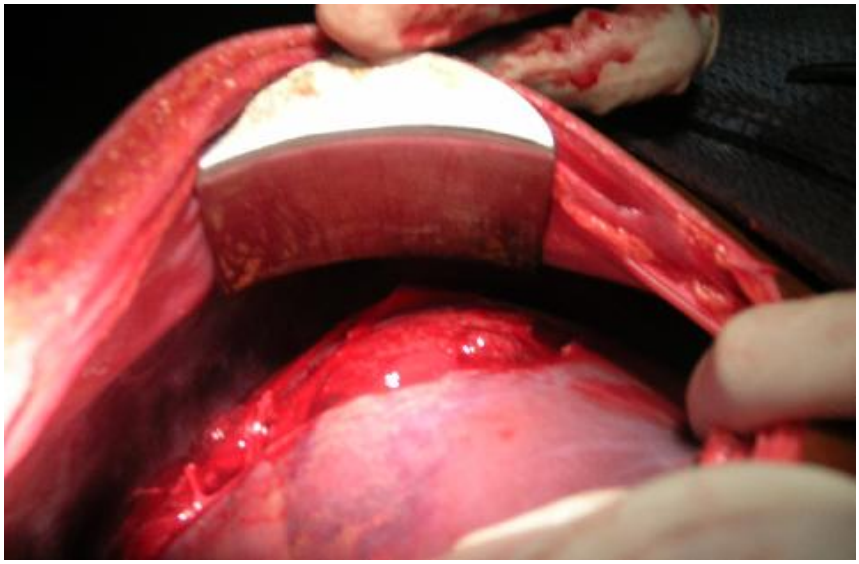
USG ABDOMEN SHOWING PANCREATIC INJURY





OPERATIVE PICTURE SHOWING LIVER INJURY

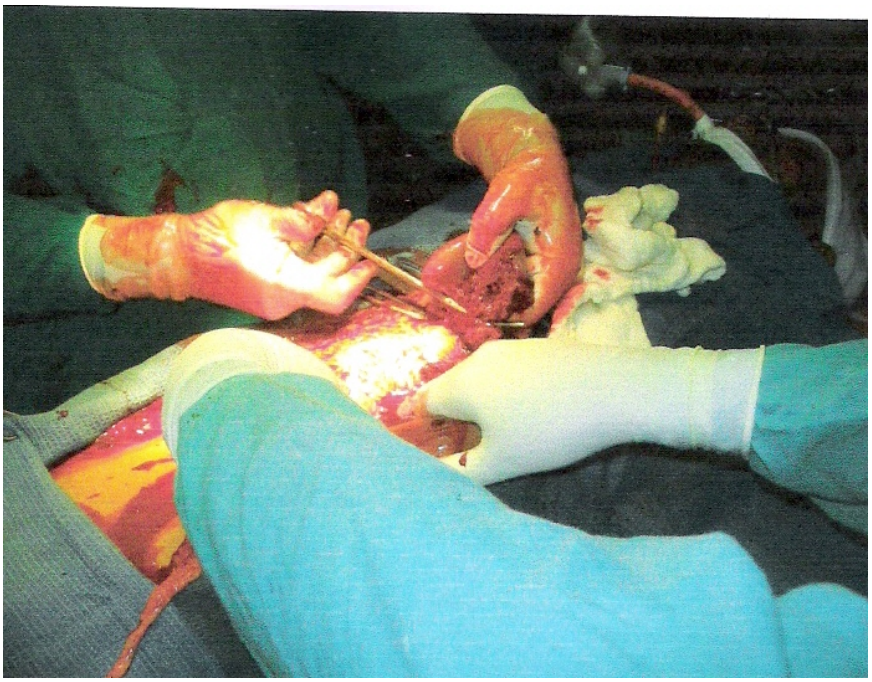




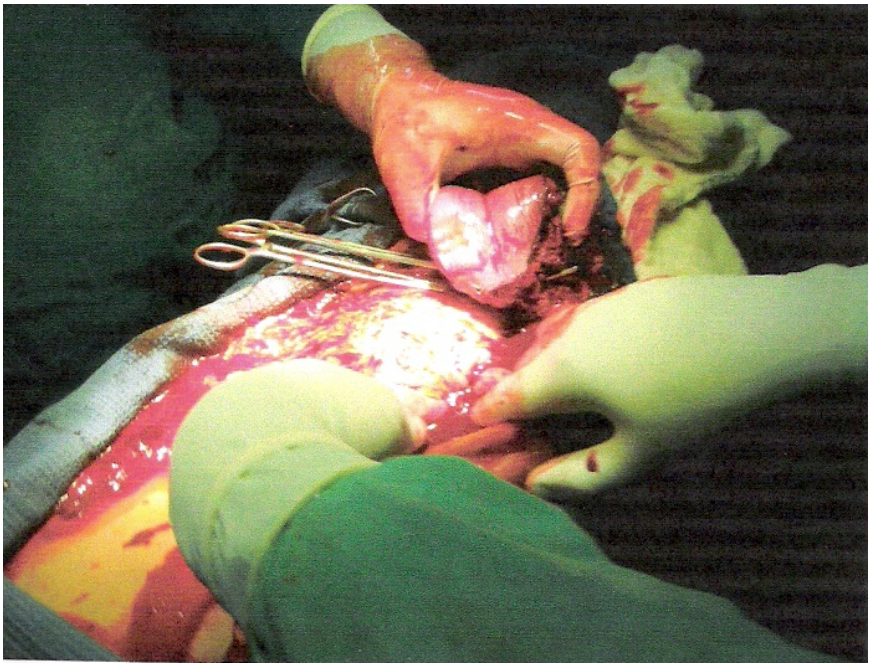
OPERATIVE PICTURE SHOWING SPLENIC INJURY

SPLENECTOMY BEING PERFORMED

Pic - 1



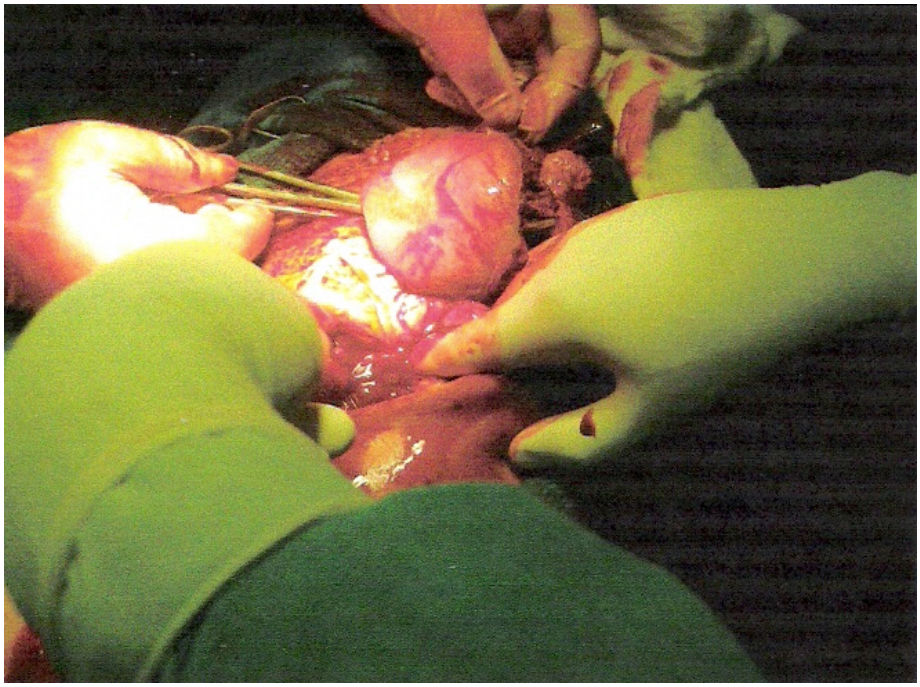
Pic - 2



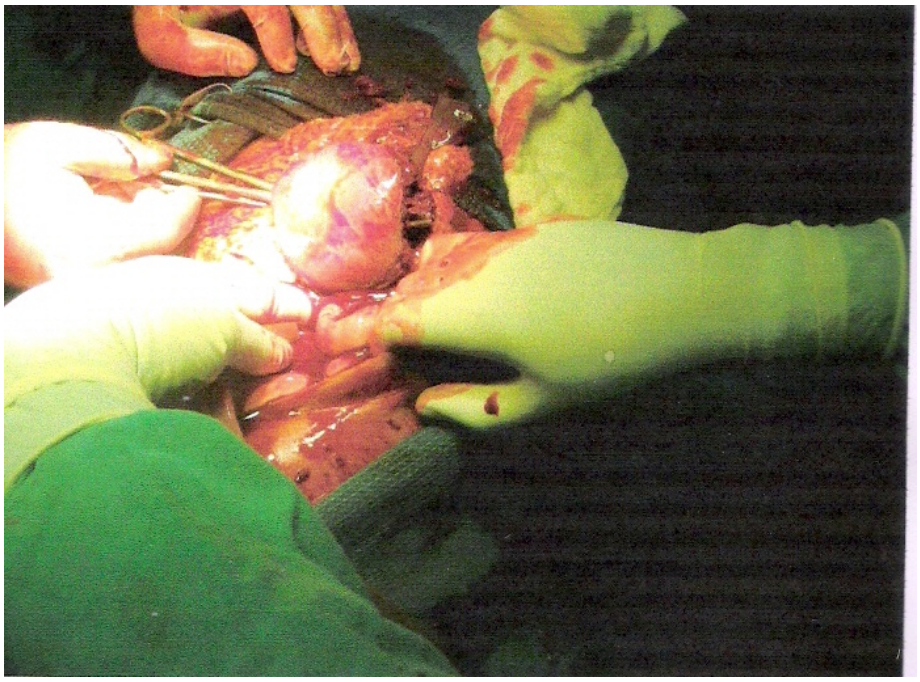
OPERATIVE PICTURE SHOWING SPLENIC INJURY

SPLENECTOMY BEING PERFORMED

Pic - 3



Pic - 4



KEY TO MASTER CHART

1	S.no - Serial Number
2	Name - Patients Number
3	Age
4	Sex M - Male F - Female
5	IP. No – Inpatient number
6	D.O.A - Date of Admission
7	D.O.D - Date of Discharge
8	ST - Stay in Hospital – no. of days
9	MO - Mode of injury R - Road Traffic Accident A - Assault F - Fall from Height W - Fall of weight
10	O.I - Organs Injured S - Splenic Injury L - Liver Injury K – Kidney injury P – Pancreas B -Bladder rupture (Intra Peritoneal) D -Diaphragmatic Injury As.Co.P – Ascending colon perforation Ds.Co.P – Descending colon perforation IP - ileal Perforation JP - Jejunal Perforation O - Others
11	P - Signs of Peritonitis (+) -Present (-) - Absent
12	Ex - External injuries (+) -Present (-) - Absent
13	As.I - Associated injuries (Extra Abdominal) FR-Fracture Ribs FF-Fracture Femur FP-Fracture Pelvis H-Head Injury N -NIL
14	P.T - Peritoneal Tapping (+) - Positive (-) - Negative
15	USG - Ultrasonography (+) – evidence of injury (-) - inconclusive
16	CT - C.T scan (+) – evidence of injury (-) - inconclusive N – Not done
17	DPL - Diagnostic Peritoneal Lavage (+) – Positive (-) Negative N – Not done
18	MGT - Management SP – Splenectomy PS – Primary suturing C – Conservative RA – Resection Anastamosis Em. LSCS – Emergency LSCS P – Packing NE – Nephrectomy OOP – Oophorectomy SEG - Segmentectomy
19	O-Outcome-Postoperative Complication D-Expired U-Uneventful W-wound infection O - Others

S.NO	NAME	AGE	SEX	IP.NO	D.O.A	D.O.D	ST	MO	O.I	P	Ex	As.I	P.T	USG	CT	DPL	MGT	O
1	1	31	M	38967	7.06.05	18.06.05	12	R	S	+	+	FR	+	+	+	N	SP	U
2	2	34	M	00993	31.06.05	20.07.05	21	R	I.P	+	-	N	+	+	N	N	RA	W
3	3	21	M	24612	11.07.05	22.07.05	12	R	M	-	+	N	-	-	+	+	PS	U
4	4	37	M	26574	01.08.05	11.08.05	11	F	S	+	+	FR	+	-	+	N	SP	U
5	5	52	F	14034	15.08.05	26.08.05	12	R	S	-	+	O	+	+	+	N	SP	U
6	6	40	M	18591	01.09.05	12.09.05	12	A	L	+	-	FR	-	+	+	N	C	U
7	7	22	M	52194	17.09.05	28.09.05	12	R	K	-	+	FF	-	+	+	N	C	U
8	8	33	F	1511	02.10.05	12.10.05	11	R	L	+	+	N	+	+	N	N	Em.LSCS +PS+P	U
9	9	6	M	25710	15.10.05	26.10.05	12	R	RPH	-	+	FP	-	-	+	-	C	U
10	10	25	M	28034	30.10.05	20.11.05	22	R	As.Co.P	+	-	N	+	+	N	N	PS	W
11	11	34	M	14781	13.11.05	25.11.05	13	R	S	-	+	FR	+	+	N	N	SP	U
12	12	10	M	37276	22.11.05	04.12.05	13	F	D	+	+	N	-	+	+	N	PS	U
13	13	23	F	46011	03.12.05	20.12.05	17	A	J.P	+	-	N	-	-	+	+	PS	W
14	14	35	M	37407	16.12.05	27.12.05	12	R	S	-	+	FR	+	+	+	+	SP	U
15	15	12	M	58732	03.01.06	12.01.06	10	R	M	+	-	N	+	+	-	N	PS	U
16	16	46	M	86389	09.01.06	19.01.06	11	R	S	+	+	FR	+	+	N	N	SP	U
17	17	24	M	86684	16.01.06	26.01.06	11	R	L	-	+	O	-	-	+	+	C	U
18	18	49	F	78571	04.02.06	14.02.06	11	R	L	+	+	FR	+	+	+	N	PS	U
19	19	39	M	87250	07.03.06	22.03.06	16	A	M	-	+	FP	-	-	-	+	PS	O
20	20	23	M	10777	18.03.06	30.03.06	13	R	S	+	-	N	+	+	N	N	SP	U
21	21	58	M	11150	06.04.06	26.04.06	21	R	I.P	+	+	N	-	+	+	N	RA	D
22	22	8	F	11063	01.05.06	21.05.06	21	F	S	+	+	FR	+	+	+	N	C	U
23	23	25	M	7597	17.05.06	02.06.06	17	R	K	-	+	H	-	+	+	-	C	U
24	24	31	M	14796	31.05.06	10.06.06	11	A	J.P	+	-	O	-	-	+	+	PS	W
25	25	43	M	1045	15.06.06	30.06.06	16	R	S	+	+	FR	+	+	N	N	SP	O

26	26	16	M	15362	03.07.06	12.07.06	10	R	S	+	+	N	+	+	+	N	SP	U
27	27	32	M	16913	07.07.06	17.07.06	11	R	RPH	-	+	FP	-	-	+	-	C	U
28	28	26	M	17373	13.08.06	30.08.06	18	R	B	+	-	FP	+	+	+	N	PS	U
29	29	65	F	14797	29.08.06	07.09.06	10	W	L	+	+	FR	-	+	+	N	C	U
30	30	18	M	17730	11.09.06	20.09.06	10	R	OV	-	-	FP	-	-	+	-	OOP	U
31	31	33	M	18213	04.10.06	14.10.06	11	A	S	+	+	N	+	+	N	N	SP	U
32	32	41	M	18238	18.10.06	29.10.06	12	R	M	+	-	N	+	+	+	N	PS	U
33	33	38	M	14679	01.11.06	12.11.06	12	R	S	-	+	FR	+	-	-	+	SP	U
34	34	27	M	18297	07.11.06	17.11.06	11	R	S	+	+	N	+	+	N	N	SP	U
35	35	34	M	27082	21.11.06	02.12.06	10	R	K	+	+	N	-	+	+	-	NE	U
36	36	42	M	25649	06.12.06	20.12.06	15	R	L	+	-	FR	+	-	+	+	C	U
37	37	55	F	23377	12.12.06	16.12.06	05	R	D.Co.P	-	+	FF	+	+	N	N	PS	D
38	38	60	M	28559	05.01.07	14.01.07	10	W	S	+	+	N	+	+	+	N	SP	U
39	39	28	M	40877	07.01.07	17.01.07	11	R	L	+	-	O	-	+	+	N	SEG+PM	U
40	40	35	M	28740	21.01.07	31.01.07	11	R	S	+	+	FR	+	+	N	N	SP	U
41	41	36	M	32380	09.12.07	18.02.07	10	A	RSH	-	+	FP	-	-	+	-	C	U
42	42	29	M	35783	18.02.07	27.02.07	10	R	L	-	+	N	+	+	+	N	PS	U
43	43	36	F	5717	03.03.07	17.03.07	15	R	I.P	+	-	N	+	+	+	N	PS	W
44	44	15	M	00924	24.03.07	04.04.07	12	R	S	+	+	FR	+	-	+	+	SP	U
45	45	33	M	12640	09.04.07	20.04.07	12	R	P	-	+	N	-	+	+	N	C	U
46	46	50	M	17874	18.04.07	30.04.07	13	F	S	-	-	N	-	+	+	N	SP	O
47	47	43	M	19900	05.05.07	14.05.07	10	R	L	+	+	FR	+	-	+	N	C	U
48	48	32	M	20651	13.05.07	23.05.07	11	R	J.P	+	+	FF	-	+	N	N	PS	U
49	49	24	F	21777	07.06.07	16.06.07	10	R	S	+	-	N	+	+	N	N	SP	U
50	50	38	M	21862	23.06.07	04.07.07	12	R	L	-	+	FR	+	-	+	N	C	U
51	51	47	M	22506	07.07.07	17.07.07	11	A	S	-	+	N	-	+	+	N	SP	U
52	52	27	M	24328	20.07.07	03.08.07	14	R	D.Co.P	+	-	N	+	+	+	N	PS	W
53	53	39	M	25725	01.08.07	11.08.07	11	R	L	-	+	N	+	+	+	N	PS	U